

11V-37

392382

P-148

Transient and Steady-State Tests of the Space Power Research Engine With Resistive and Motor Loads

Jeffrey S. Rauch
NYMA, Inc.
Engineering Services Division
Brook Park, Ohio

and

M. David Kankam
National Aeronautics and Space Administration
Lewis Research Center
Cleveland, Ohio

(NASA-TM-106832) TRANSIENT AND
STEADY-STATE TESTS OF THE SPACE
POWER RESEARCH ENGINE WITH
RESISTIVE AND MOTOR LOADS (NASA.
Lewis Research Center) 147 p

N95-19238

Unclass

G3/37 0037969

January 1995



National Aeronautics and
Space Administration

Transient and Steady-State Tests of the Space Power Research Engine with Resistive and Motor Loads

By:
Jeffrey S. Rauch, NYMA, Inc.*
and
M. David Kankam, NASA LeRC

Abstract

The NASA Lewis Research Center (LeRC) has been testing free-piston Stirling engine/linear alternators (FPSE/LA) to develop advanced power convertors for space-based electrical power generation. Tests reported herein were performed to evaluate the interaction and transient behavior of FPSE/LA-based power systems with typical user loads. Both resistive and small induction motor loads were tested with the Space Power Research Engine (SPRE) power system.

Tests showed that the control system could maintain constant long term voltage and stable periodic operation over a large range of engine operating parameters and loads. Modest resistive load changes were shown to cause relatively large voltage and, therefore, piston and displacer amplitude excursions. Starting a typical small induction motor was shown to cause large and, in some cases, deleterious voltage transients.

The tests identified the need for more effective controls, if FPSE/LAs are to be used for stand-alone power systems. The tests also generated a large body of transient dynamic data useful for analysis code validation.

1.0 Introduction

The NASA Lewis Research Center (LeRC) has been testing free-piston Stirling engine/linear alternators (FPSE/LA) to develop advanced power convertors for space-based electrical power generation. These tests were conducted in support of the NASA Civil Space Technology Initiative (CSTI) High Capacity Power Program. The Space Power Research Engine (SPRE), built by Mechanical Technology Inc. (MTI) of Latham, New York, has been tested extensively in support of this program [Cairelli, Wong, Dochat, etc.]. Much of this testing has been directed at improving engine and alternator performance, and obtaining steady-state data for validating design and analysis codes [Huang, 1992 & Geng, 1992].

Many hours of Space Power Demonstration Engine/Space Power Research Engine (SPDE/SPRE) steady-state operation at MTI and NASA LeRC have contributed to understanding the basic mechanical, dynamic and thermodynamic behavior of FPSE/LAs. These tests have been performed with nearly constant load conditions. Relatively little attention has been given to load interaction and control dynamics of FPSE/LAs. System design studies reported in the literature-to-date are either limited to "block diagrams" with little detail or include a power conditioning, control and storage module which effectively isolates the FPSE/LA from system load transients. Thus, this study was conducted to both gather transient data and test the control system.

The parasitic "laboratory" loads and controls used for steady-state testing have been effective in ensuring stable periodic operation and tolerating small disturbances. The parasitic loads and the associated controls have evolved slowly. The NASA SPRE test facility load and controls are close to state-of-the-art in that they incorporate a hybrid analog-digital controller and a switched resistive load which uses solid-state relays.

*Mr. Rauch is currently with ANALEX Corp. at NASA LeRC.

A further improvement over previous SPRE load controls is that integral in addition to proportional feedback control is used. Other FPSE/LA systems using digital computer control have been implemented e.g., NASA SPIKE, MTI and NASA Component Test Power Converter (CTPC) facility. These controls use digital computer control.

Tests were conducted from December 1992 to December 1993 at NASA LeRC, using the SPRE, to evaluate the interaction characteristics of FPSE/LAs with typical user loads.

The primary objective of the tests reported herein was to determine the transient characteristics of a free-piston Stirling engine/linear alternator (FPSE/LA), of which the SPRE is an example, coupled to resistive and motor loads. A secondary objective was to provide transient data which could be used to validate transient analytic predictions [Kankam, 1991, 92 & 93].

2.0 SPRE Engine and Test Overview

The transient tests were conducted using the SPRE FPSE/LA and test facility at NASA LeRC, Figure 2-1. The SPRE test facility was modified to make it functionally equivalent to NASA's FPSE/LA Controls and Load Interaction Test Facility [Rauch, 1992] by the addition of user loads. Also, the Data Acquisition System (DAS) was upgraded to record both high-speed transient and high-speed failure data or emergency shutdown. Prior to these tests the SPRE was modified to evaluate its performance with reduced number of cooler tubes, a configuration retained for this test. The parasitic load control for this facility was modified to improve voltage regulation, and by adding user loads. The engine/alternator, load control and DAS are described further in the following sections.

2.1 SPRE Engine/Alternator

The SPRE Hybrid engine used, Figure 2-2, [Wong, 1992 and Cairelli, 1993] is a combination of the best components of the SPRE-I and II engines. The components from the SPRE-I include the heater head assembly with regenerator and cooler, displacer assembly, post and flange assembly with displacer position sensors, piston position sensor assembly and alternator pressure vessel. The components from the SPRE-II include the power piston and cylinder, joining ring and alternator.

The cooler was modified by reducing the number of cooler tubes from 1584 to 1056, as described by [Wong, 1992 & Cairelli, 1993]. Some tests were conducted with better, i.e. smaller, seal clearances for the forward and aft displacer gas springs. After a test on April 8, 1993, in which a displacer rub was clearly identified as the cause of recurring unplanned engine stalls, the displacer was replaced with one which had a slightly larger seal clearance (from 50 to 66 μ m). This configuration was tested on May 26 after which the displacer clearance was again increased (to 100 μ m). Subsequent tests did not encounter unplanned shutdowns, and no further internal changes were made during this test series. Engine performance was slightly lower for this configuration, compared to the best obtained for the reduced cooler tube tests [Cairelli, 1993]. However, the low performance did not substantially affect the results of this test.

The power piston and cylinder, joining ring and alternator used for this test constitute the "high-efficiency" alternator configuration. The magnetic materials of these components in the original SPRE were replaced with non-magnetic materials which reduced eddy current losses in the alternator support structure. The loss reduction resulted in improved alternator efficiency.

2.2 Parasitic Control and User Loads

Figure 2-3 is a schematic of the SPRE electrical load system. The alternator terminals (A and G) are connected to a series "tuning" capacitor (A-B) the reactance of which cancels the inductive reactance of the linear alternator. The tuning capacitor is adjustable from 295 to 805 μ f, in steps of 2 μ f, by switching

capacitors C2 through C9. The element C1 is a fixed 295 μ f capacitance. This adjustable tuning capacitance allows the alternator inductance to be balanced for operating frequencies of at least 60 to 105 Hz. Loads connected to the AC output terminals (B-G) include a parasitic control load bank and three switchable auxiliary (or user) loads.

The parasitic control load consists of 16 parallel coarse resistors of 20 Ω each and 8 parallel binarily increasing fine resistors of 40 Ω to 5120 Ω . The rated voltage is 240 Vrms. Hence, the rated capacity is 49 kWe and power may be controlled within a resolution of 6 W (at 240 Vrms). This is more than adequate for the SPRE which has a design power output of 12.5 kWe. These control resistors are connected to the AC bus by zero-crossing type solid-state relays (S), which are controlled by a hybrid analog/digital feedback control circuit.

The hybrid analog/digital feedback control measures the AC bus voltage (via a voltage divider V_{control}). This AC signal is converted to a DC level by a RMS/DC converter and low pass filter to obtain a DC feedback signal. The feedback signal is subtracted from the set point signal to obtain the error signal for the proportional-integral (PI) control. The PI control output voltage is sampled by an analog to digital (A/D) converter. The digital output then drives the solid-state load control relays. The low order 8 bits drive the fine load directly while the next 4 bits drive the coarse load via a decoder which converts the high order bits to the corresponding number of loads. The digital output is disabled while the instantaneous AC voltage is within ± 30 V to insure that the control signals to all solid-state relays are synchronized when they detect the zero-crossing. Thus, the AC voltage amplitude must be greater than 30 volts for the control to operate properly. This is not a serious limitation, since the AC voltage amplitude is typically 155 to 340V.

Auxiliary loads are manually connected to the AC bus via mechanical relays (rather than solid-state relays). These loads are included to simulate typical user loads. Two auxiliary load relays are connected to $\approx 20\Omega$ resistors (identical to coarse control loads). The third auxiliary load relay was connected to one of several motors tested. These relays are arranged such that a trigger signal is sent to the high-speed DAS when one or more auxiliary load relay is switched. This allows the DAS to capture the switching transient. Any combination of auxiliary loads could be simultaneously switched.

2.3 Data Acquisition

Figure 2-4 is a schematic of the Transient Data Acquisition System (TDAS) used for the SPRE transient tests. The TDAS host computer is a 80286/7 PC/AT running MSDOS. Quasi steady-state (less than 10 Hz) measurements are scanned and digitized by the multiplexer (MUX) which is interfaced to the host PC/AT via a digital I/O board. Dynamic measurements are scanned and digitized by a high-speed analog to digital converter (A/D) board installed in the PC/AT. The custom software is written entirely in the "C" programming language.

Physical steady-state parameters are first converted to voltages by appropriate transducers and analog signal conditioners. The 256 channel, low speed (≈ 700 samples/sec) multiplexer (MUX) is controlled directly by real-time software running on the PC/AT. The channel and range for each measurement is first set, then the MUX is triggered and the digitized output is read. The real-time software converts these raw measurements into engineering units for display and storage.

The uniqueness of TDAS lies in its capability to acquire and process periodic (50-100 Hz) and transient dynamic measurements, with high amplitude, phase resolution and accuracy. Dynamic physical parameters are, like steady-state parameters, converted to voltages by transducers and analog signal conditioners. Special care is required in selecting transducers and signal conditioners for these measurements to minimize relative phase errors. Dynamic signals are preamplified by matched differential instrumentation amplifiers. Each of the amplifiers contains a low-pass filter. The filter cut-off frequency is set to 100 kHz to minimize measurement phase errors. The preamplifier outputs are scanned and digitized by a 16 channel, 12-bit, high-

speed (200 kilo-sample/sec total throughput) analog to digital (A/D) converter installed in the PC/AT. The A/D is relatively unique in that it can be programmed to sequentially sample up to 4 groups of 4 simultaneously sampled channels at a time. Also, the A/D board contains a 256k sample on-board data buffer so that high-speed data acquisition can proceed independently of the host PC/AT, and is thus, not limited by bus speed and traffic. The A/D board can be programmed for either software or external triggering.

For routine monitoring and recording of steady-periodic data, the A/D first samples one data channel (usually piston position) at a known sampling rate. This data is analyzed to determine the current operating frequency (f). Then all dynamic channels are sampled at a frequency of f_s , a multiple of the operating frequency, determined by:

$$f_s = f * N_s / N_c$$

where N_s is the number of samples recorded (typically 257) and N_c is the number of engine cycles (typically 4) over which the data must be recorded. This sampling strategy minimizes errors introduced by the Discrete Fourier Transform (DFT) used to compute the 1st harmonic amplitude and phase for each channel. Since the raw data is obtained for an arbitrary time window, the phase is computed relative to a reference signal (typically piston position) for each channel. The computed phase is also corrected for time skew between non-simultaneous data channels. The mean, RMS and total harmonic distortion for each data channel are also computed. These calculated values are then converted to appropriate engineering units, stored along with steady-state data and displayed. The raw dynamic data, in integer form, is separately stored as part of permanently recorded readings. Very accurate amplitude measurement of dynamic signals is routine and largely dependent on calibration of the transducers, signal conditioners and other equipment. Accurate, high-resolution ($<1^\circ$) phase measurement is, on the other hand, more difficult and requires special attention to the A/D sampling characteristics, effective data resolution and processing algorithm, in addition to the frequency response of the transducers, signal conditioners, amplifiers and filters. Tests have shown that TDAS phase errors are less than $\pm 0.1^\circ$ for signal amplitudes greater than 10% of the full scale range of the A/D converter, and drops to less than $\pm 0.02^\circ$ for amplitudes over 80% of full scale. This includes phase errors in the preamplifier/filters which are installed on all channels. Phase errors between channels in the same simultaneously sampled group are slightly smaller than intragroup channels. In either case, satisfactory phase accuracy is routinely obtained.

For acquisition of transient data, the A/D board is programmed to collect a total of 2000 samples/channel over nearly 64 engine cycles. Thus, approximately 31 samples/cycle/channel are collected. Also, the A/D board is programmed to continuously save pre-trigger data in on-board memory, writing over the oldest data, while waiting for an external trigger. Once the trigger is detected, 1800 post-trigger samples/channel are saved in on-board memory. Then the data is stored on the PC's hard disk for later evaluation.

Although the high-speed signals are filtered by the pre-amplifiers, these are not used as anti-alias filters, since the pass band (100 kHz) is well above the sampling frequency (1.5 to 3.1 kHz). Dynamic signals from FPSE/LAs have low noise and low amplitude higher harmonics. Therefore, anti-alias filters have not been needed. Generally, anti-alias filters with a bandwidth near the operating frequency are useful. However, such filters introduce significant (relative to 0.1°) channel to channel phase shift.

3.0 Test Overview

Table 3-1 summarizes transient tests performed on the SPRE. Data was obtained for 14 test runs. Early transient tests were interspersed with the Reduced Cooler Tube (RCT) tests which required changes to the engine/alternator configuration. Also, tests prior to June 29, 1993 were occasionally interrupted by unplanned engine stalls which were attributed to mechanical displacer rubs. This section briefly summarizes some of the more significant transient tests conducted from December 1992 through December 1993. The

detailed results discussed in Sections 4 and 5 pertain to tests conducted from June 29, 1993 through December 17, 1993. During this later period, neither the engine/alternator nor the parasitic load control was changed.

Table 3-1

Summary of SPRE Transient Tests

Test Date	Description
--- SPRE Hybrid Build 11 ---	
12/16/92	RCT Performance Test (ESCORT DAS)
12/30/92	c/o TDAS
1/15/93	Resistive, c/o TDAS
1/20/93	Resistive
--- SPRE Hybrid Build 12 ---	
2/22/93	Mini Run
2/23/93	Resistive, base load control parameters, off-tune alt capacitance comparison data from ESCORT DAS
2/24/93	RCT Performance Test (ESCORT DAS)
--- SPRE Hybrid Build 13 ---	
3/17/93	Mini Run, c/o TDAS
3/29/93	RCT Performance Test (ESCORT DAS)
--- SPRE Hybrid Build 14 ---	
4/08/93	Mini Run, displacer rub stall recorded w/ TDAS
5/26/93	Resistive, off-tune alt cap.
--- SPRE Hybrid Build 15 ---	
6/29/93	Mini Run, Resistive, 1/3 HP motor
6/30/93	Resistive, 1/3 HP motor
7/01/93	Resistive, 1/20 HP motor
7/13/93	1/6 HP motor
11/18/93	Resistive, 1/6 & 1/3 HP motors w/ start capacitors
12/13/93	Motor characterization w/ Power supply
12/17/93	Resistive, 1/5 HP motor w/ fan, off-tune alt capacitance.

Transients due to switching in and out one resistive load (20Ω) were routinely recorded during most, if not all, of the test runs. These transients were usually initiated with the engine operating at piston amplitudes of nearly 8 mm, to avoid transient over-stroke conditions. Transients were recorded for operating pressures of 5 to 15 MPa, and heater-to-cooler temperature ratios of 1.6 to 2.2. Resistive load transients were often repeated over the course of the tests. Several transients due to simultaneous switching of 2 loads (or 10Ω) were also recorded. Although not discussed in detail here, they resulted in excursions with amplitudes twice as large as those of the one load (20Ω) transients.

The load control for tests conducted prior to 4/8/93 had only proportional control. This control required manual set point adjustments for all but minor operating condition changes to maintain constant alternator voltage and, thus, piston amplitude. Also, the feedback voltage was conditioned by a 2-pole, 6 Hz filter in the RMS/DC converter and a 4-pole, 7 Hz, post-filter. Starting with the test on 4/8/93, integral control was added to the proportional control. Also, the post-filter of the RMS/DC converter was reduced to a 2-pole Butterworth type and the cutoff frequency was increased to approximately 14 Hz. This substantially improved the long term voltage regulation and increased the short term frequency response.

Several motors were tested with the SPRE system. The name plate data for each is listed in Table 3-2. The 1/3, 1/6 and 1/20 HP motors were tested without mechanical loads. The 1/5 HP motor was part of a packaged fan unit used for cooling instrument racks.

Table 3-2 **SPRE Transient Test Motor Loads**

1/3 HP	Mfg: General Elec. Model: 5XBH00DC 115V, 60 Hz, 1 Ph, 6.8 A, 1725 RPM
1/5 HP	Fan unit mfg: Crenlo Inc. Model: 838403, S/N: 371 Motor mfg: McLean Engineering Model: SU59FG4IX Part No: S-2013 115 V, 50/60 Hz, 1 Ph, 2.6/2.8 A, 1350/1600 RPM
1/6 HP	Mfg: Emerson Elec. Model: S60CXBKL-2953, Type: S, Frame: A56Y, Code: L 115 V, 60 Hz, 1 Ph, 3.4 A, 1725 RPM
1/20 HP	Mfg: Westinghouse Type: FE, Frame: DT42 115 V, 60 Hz, 1 Ph, 2.55 A, 1050 RPM

Tests of the various motors were conducted with the SPRE running at a mean engine pressure of 5 MPa, with operating frequency of 62 Hz, an alternator voltage of 110 Vrms and piston amplitude of 8.8 to 9.0 mm. Motor start transients were obtained at temperature ratios from 1.7 through 2.2. The reported cases relate to temperature ratio of 2.

Initial attempts to start the 1/3 HP motor (on 6/30/93) were unsuccessful. Attempts were made for temperature ratios from 1.7 to 2.1. The steady-state engine/alternator output varied from 1.3 to 2.7 kW in the stated temperature range, compared to the rated motor power of 250 W (1/3 HP). The motor has a

start coil which is disengaged as the motor approaches its rated speed. However, during the test, the inrush current appeared to have overloaded the engine/alternator, since there was no indication of the start coil disengaging.

Initial attempts to start the 1/6 HP motor (on 7/13/93) were successful in one out of 8 attempts. The one successful start followed an unsuccessful attempt at the same initial conditions (temperature ratio of 2.0, where the engine/alternator power output was 2.4 kWe). The motor failed to start in two subsequent attempts at a temperature ratio of 2.1, and alternator power output of 2.7 kW. Similarly to the 1/3 HP motor, the 1/6 HP motor has a start coil which is disengaged as the motor approaches its rated speed. The motor speed appeared to increase past the point of disengaging the start coil before the engine stall was initiated. The load voltage was recovering (increasing after the initial drop), and motor current was dropping when the stall occurred. The data, in this case, suggests that the over-stroke protection initiated the shutdown.

External capacitors of 60 μ f and 120 μ f were added to the starting coils of the 1/6 and 1/3 HP motors, respectively, to reduce the starting current. Several starts were successful with the 1/6 HP motor on 11/18/93. However, one stall occurred although the engine output was the same as, or higher than, the value of successful starts. The over-stroke protection was disabled and several additional starts were completed. The 1/3 HP motor, with its start capacitor, was also tested on 11/18/93. Several starts with disabled over-stroke protection were completed. One start caused a piston over-stroke alarm which would have initiated a shutdown. Inrush current for both motors with start capacitors was about half that of the motors without capacitors.

A 1/20 HP motor tested on 7/1/93 started very easily at nearly constant voltage. A low temperature ratio of 1.6 and power output of 1 kWe were adequate for start of this motor which has a rated power of only 37 W (1/20 HP). Relatively little is known about the topology or operating characteristics of this motor.

A 1/5 HP motor with a fan load was tested on 12/17/93 and started easily. This motor/fan accelerated to speed relatively slowly, in 2.4 sec, compared to 0.5 sec. for the 1/6 HP motor. The transients lasted longer than the transient data time window of 1 sec. The slow starting was probably due, in part, to higher inertia and load of the fan. However, the relatively low inrush current suggests development of a low electrical torque. Unlike the 1/6 and 1/3 HP motors, the "start" coil does not disengage with speed build-up, but remains connected to the line through an external 6 μ f run capacitor. Again, not much is known about the topology or characteristics of this motor. Several tests have been performed to determine the characteristics of the motors.

4.0 Steady-State Results

Steady-state performance measurements of the SPRE during the transient tests were obtained for comparison with prior data. The data obtained was largely a by-product of the TDAS. Measured and calculated steady-state results for runs on 6/30, 11/18 and 12/17/93 are discussed. Appendix A contains summary data for each run. Appendix B contains complete sets of steady-state data for several selected operating points.

The internal engine/alternator configuration for these tests was not changed, as the SPRE was not disassembled in this time period. Also, no changes were made to the external load or control systems. Thus, performance variations can only be attributed to: 1) differences in the operating parameters, 2) instrument calibration drift or 3) engine degradation. All major and most minor operating parameters were either directly measured or were calculated from measured parameters. Since the SPRE was not disassembled in the period prior to the test on 6/29 to after the test on 12/17/93 (and has not been

disassembled to-date), no calibrations of the internal or external instruments were performed in this period. Thus, comparisons between data obtained in this period will not be biased by changes due to the instrument calibration process but may be affected by long term drift in instrument calibration.

The following sections discuss engine/alternator performance variations over the test period, followed by brief discussions of the various operating parameters plotted in Figures 4.1 to 4.4.

4.1 Engine Performance:

The overall engine performance was reasonably stable for the tests on 6/30, 11/18 and 12/17/93, with less change between the tests on 6/30 and 11/18/93. Data at a mean pressure of 12.5 MPa, temperature ratio of 2.0 and piston amplitude of 8 mm was obtained for each test and is compared in Table 4-1.

Table 4-1 SPRE Performance at Constant Conditions

Parameter	Acronym	Unit	Test Date		
			6/30	11/18	12/17
Reading No.			57	58	56
Electrical Power	Kwalt	kW	6.92	6.94	6.55
Piston PV Power	pvpst	kW	8.57	8.87	8.24
Mean Pressure	pmean	MPa	12.50	12.51	12.51
Temperature Ratio	trtow	--	2.004	1.999	2.003
Piston Amplitude	Xp.a.	mm	8.019	7.995	8.022
Alt Capacitance	cap	μ f	337.3	349.7	336.7
Frequency	freq	Hz	94.62	95.91	94.74
Displacer Amp.	Xd.a	mm	8.978	9.018	8.881
Displacer Phase	XD.p	deg	76.31	75.81	76.86
Piston Vel Amp.	vpa	m/s	4.768	4.768	4.776
Load Voltage	Vacls.r	Vrms	145.5	144.9	146.8
Aft Disp Spr Damp'g	cads	n-s/m	29.75	25.71	26.69
Fwd Disp Spr Damp'g	cfds	n-s/m	23.87	20.52	22.54
Tot Disp Spr Damp'g		n-s/m	53.62	46.23	49.23

The electrical power output for runs on 6/30 and 11/18 remained nearly the same. However, the value was nearly 400W or 5.6% lower on 12/17. This was partly due to lower displacer amplitude relative to piston amplitude. Low displacer amplitude may be caused by gas spring leakage losses or rubs. The data does not clearly show gas spring losses, as indicated by the damping coefficients, as the cause of low displacer amplitude.

4.2 Electrical Power Output vs Voltage:

Figures 4-1.a through c show the total engine/alternator power output as a function of output voltage, for several levels of mean pressure and temperature ratio. The total power includes both the parasitic control load and auxiliary load(s). The load voltage is measured across the parasitic and auxiliary loads, after the alternator tuning capacitor, rather than at the alternator terminals.

The load power output increases approximately linearly with load voltage, and increases with both increasing mean pressure and temperature ratio.

4.3 Load Voltage vs Piston Amplitude:

Figures 4-2.a through c show that the load voltage increases linearly with piston amplitude and increases with increasing mean pressure. Load voltage drops slightly as temperature ratio increases, due to increased alternator losses.

4.4 Displacer Amplitude vs Piston Amplitude:

Figures 4-3.a through c show that the displacer amplitude increases linearly with piston amplitude. Displacer amplitude also increases with both mean pressure and temperature ratio.

4.5 Displacer Phase vs Piston Amplitude:

Figures 4-4.a through c show that the displacer phase (measured relative to the piston) decreases slightly with increasing piston amplitude. Displacer phase increases with mean pressure and decreases with temperature ratio. For constant mean pressure, the slope of the phase vs amplitude curve is approximately constant for varying temperature ratio, but increases for increasing mean pressure.

5.0 Transient Results

5.1 Resistive Load Transients:

Figures 5-1.a through d show the response to switching in a 20Ω resistive load with the engine/alternator operating at a mean pressure of 5.0 MPa, temperature ratio of 2.0 and piston amplitude of 8 mm with the alternator capacitor tuned (Data File: 063093, Reading 27). The resistance is switched in (parallel with the parasitic control load) at nearly 0.1 sec. in Figures 5.1. The load voltage initially drops, as seen in Figure 5-1.a, and then the control (see Fig. 2-3) responds to the voltage error. The oscillation in the voltage amplitude (and other dynamic parameters) is due to lag in the voltage feedback filter and proportional-integral (PI) controller. The period of this oscillation is 0.32 sec.

The current to the auxiliary load, as seen in Figure 5-1.b, is zero before the switch closes. When the switch closes, the current goes through initial excursions, and finally settles to a steady-state amplitude. The relay closes at a non-zero voltage. This is evident in Figure 5-1.c which shows the auxiliary current plotted with an expanded time scale. Figure 5-1.d shows the total load current which includes both the parasitic and auxiliary load currents. This figure shows that the total current converges to the same amplitude as that prior to engaging the auxiliary load. Figures 5-1.e and f show the response of the piston and displacer to the load transient. The piston response is very similar to that of the voltage, due to the relatively stiff electro-mechanical coupling of the alternator. The displacer response, while similar, is slightly attenuated.

The system quickly settled to steady-state operation with the 20Ω load connected, then 18 sec later, the same load was switched out (Reading: 28). Figures 5-2.a and b show the voltage and total current responses to switching out the 20Ω load. The amplitude envelopes of the switch-out event are, in each case, symmetrical with those of the switch-in event.

A resistive transient initiated at a high power operating point is shown in Figures 5-3.a to f. The engine/alternator was operating at a mean pressure of 12.5 MPa, temperature ratio of 2.0 and piston amplitude of 9 mm with the alternator capacitor tuned (Data File: 121793, Reading 57). The operating frequency at this point is 95 Hz (vs 62 Hz at 5 MPa). This, combined with the higher piston amplitude, results in higher amplitudes for the voltage and currents.

The transient response of this event is generally similar to those shown in Figure 5-1. The period of the amplitude oscillation is shorter, namely, 0.27 sec. compared to 0.32 sec. for the low pressure transient. The

amplitude of the voltage transient is approximately the same. The transients converge to the initial voltage and total current within 1 sec which is beyond the time period of the acquired data.

5.2 1/3 HP Motor Transients:

The first attempts to start the 1/3 HP motor resulted in stalling the SPRE. Figures 5-4.a through e show the voltage, current, piston and displacer responses to connecting the motor. The motor was engaged with the engine operating at a mean pressure of 5 MPa, temperature ratio of 2.0 and piston amplitude of 8.8 mm. Load voltage was 110 Vrms and frequency was 62 Hz (Data file: 063093, Reading 32). The motor relay closed at a non-zero voltage, at 0.12 sec. in Figures 5-4. The inrush current doubled the total current, as seen in Figure 5-4.c, for a few cycles, and overloaded the FPSE/LA such that it stalled before the motor could start. The apparent clipping in the auxiliary load current, Figure 5-4.b, was due to saturating the TDAS A/D converter. Although the motor began to rotate, the FPSE/LA stalled before the motor reached the starting coil cutout speed. The relatively faster decrease in the piston amplitude, as compared to that of the displacer, is indicative of an overloaded FPSE/LA.

The 1/3 HP motor's start coil was modified by the addition of a series, 120 μ f capacitor. This substantially reduced the starting current when connected to a constant voltage source. This configuration was tested with the FPSE/LA on 11/18/93. Figures 5-5.a through g show the FPSE/LA responses. The motor was engaged with the engine operating at a mean pressure of 5 MPa, temperature ratio of 2.0 and piston amplitude of 8.9 mm. Load voltage was 110 Vrms and frequency was 62 Hz (Data file: 111893, Reading 33). The motor relay closed slightly before a voltage zero-crossing, at 0.12 sec. in Figures 5-5. The motor started but caused severe transients in the voltage, current, piston and displacer amplitudes. In fact, had the over-stroke protection been enabled, a shutdown would have resulted.

The load voltage amplitude, Figure 5-5.a, dropped 50 V at 4 cycles after engaging the motor. The parasitic load control responded by reducing load, as indicated by a drop in total current, Figure 5-5.c. At about the time the voltage had recovered the motor speed was sufficient to disengage the starting coil, as indicated by the current discontinuities. After several more cycles the voltage amplitude peaks at 250 V, then oscillates to a steady amplitude sometime after the 1 sec. time window of the data. The piston (Figure 5-5.d) and displacer (Figure 5-5.e) amplitudes roughly track the voltage transient. The clipping in Figures 5-5.d and e is imposed by plotting limits. Figures 5-5.f and g show the same data with an expanded time scale and larger amplitude scale. The peak piston amplitude is beyond the maximum amplitude and the calibrated transducer range. However, there is no clear indication of the piston hitting mechanical limits. The displacer appears to have hit the mechanical in-stop (maximum positive position) and out-stop.

5.3 1/6 HP Motor Transients:

The first attempts to start the 1/6 HP motor start resulted in stalling the SPRE. Figures 5-6.a through e show the voltage, current, piston and displacer response to connecting the motor. The motor was engaged with the engine operating at a mean pressure of 5 MPa, temperature ratio of 2.0 and piston amplitude of 8.8 mm. Load voltage was 110 Vrms and frequency was 62 Hz (Data file: 071393, Reading 26). The motor relay closed at a non-zero voltage, at 0.12 sec. in Figures 5-6. The inrush current, which approximately doubled the total current for a few cycles, as seen in Figure 5-6.c, did not overload the FPSE/LA as it had with the 1/3 HP motor. The clipping in the auxiliary load current, Figure 5-6.b, was due to saturating the TDAS A/D converter. The motor appeared to reach the starting coil cutout speed, as indicated by the current discontinuities at 0.3 to 0.35 sec. The total current amplitude peaked at over 100 A for 1.5 cycles. The clipping in Fig. 5-6c was due to the choice of y-axis scaling, for comparison with Fig. 5-7c. This is indicative of the emergency load relay closing to shut down the engine, and occurred slightly after the piston and displacer amplitudes rose to the point of triggering a shutdown. The start coil cut-out coincided with the voltage recovery by the load control, resulting in considerable voltage overshoot. This in turn resulted in over-stroke of the piston and displacer, which in this case triggered an engine shutdown.

A second attempt to start the 1/6 HP motor at the same conditions was successful (Data file: 071393, Reading 28). Figures 5-7.a to e show the system response plotted on the same axes as in Figures 5-6.a to e. The piston and displacer amplitudes in this case exceeded those for Reading 26, and so a shutdown should have occurred. The fact that the system continued to run and the motor completely started was probably due to a procedural error which left the emergency shutdown disabled after restarting the engine. This motor start is replotted in Figures 5-8.a to e, with a longer time scale. While steady operation has not been achieved, the system is clearly converging. The motor voltage vs current, Figure 5-8.h, shows the first second of the starting event, in which the motor is still coming up to speed. Also plotted are 4 cycles of data taken 1 to 2 seconds later, although this is not distinguishable from the end of the transient and is replotted in Figure 5-8.g. This indicates that the motor was near steady-state speed within 1 sec., though it may have taken another second to completely converge.

The motor ran for about 4 min. during which a steady-state reading (#29, included in Appendix B) was obtained. Then the motor was disengaged (Reading 30). The system response, shown in Figures 5-9.a to e, is typical of all motor stop events. Other than the auxiliary load current dropping to zero, there was very little disturbance in load voltage, total current, piston amplitude or displacer amplitude.

The 1/6 HP motor's start coil was modified by the addition of a series 60 μ f capacitor. This substantially reduced the starting current when connected to a constant voltage source. This configuration was tested with the FPSE/LA on 11/18/93. Figures 5-10.a through g show the FPSE/LA responses. The motor was engaged with the engine operating at a mean pressure of 5 MPa, temperature ratio of 2.0 and piston amplitude of 8.9 mm. Load voltage was 110 Vrms and frequency was 62 Hz (Data file: 111893, Reading 26). The motor relay closed slightly before a voltage zero-crossing, at 0.12 sec. in Figures 5-10. The motor started, but it caused severe transients in the voltage, current, piston and displacer amplitudes. A previous start (Reading 23) at the same operating conditions caused the engine to stall. The over-stroke protection was disabled for this start (Reading 26).

The load voltage amplitude in Figure 5-10.a dropped 25 V in 4 cycles after engaging the motor. The parasitic load control responded by reducing load, as indicated by a drop in total current shown in Figure 5-10.c. At the time of voltage recovery the motor speed was sufficient to disengage the starting coil. However, current discontinuities in this test do not give a clear indication of the coil disengagement. After several more cycles the voltage amplitude peaked at 200 V, then oscillated to a steady amplitude sometime after a 1 sec. time window of the data. The starting current in this case, Figure 5-10.b, is roughly half that of the motor without a start capacitor, (Figure 5-7.b). The piston (Figure 5-10.d) and displacer (Figure 5-10.e) amplitudes roughly follow the voltage transient. The peak piston amplitude is close to the maximum amplitude, but there is no clear indication of the piston hitting mechanical limits. The displacer amplitude is also close to the mechanical in-stop (maximum positive position), but a hit is not obvious. The motor voltage vs. current in Figure 5-10.h shows the first second of the starting event in which the motor is still coming up to speed. Also plotted are 4 cycles of data taken 1 to 2 seconds later. However, this is not distinguishable from the end of the transient, and is replotted in Figure 5-10.g. This is indicative of near steady-state speed operation within 1 to 2 seconds.

5.4 1/5 HP Motor-Fan Transients:

A 1/5 HP motor-fan normally used for instrument rack cooling was tested with the SPRE on 12/17/93. This was the only motor tested with a useful load. Major differences in this motor from the 1/3 and 1/6 HP motors were that it included a 6 μ f capacitor in series with the high impedance coil which was continuously connected to line voltage. Also, the fan added both inertia and load to the inertia and friction of the motor. Figures 5-11.a to e show the voltage, current, piston amplitude and displacer amplitude responses to starting the motor-fan (Data File 121793, Reading 18). The "starting" coil configuration apparently had a profound effect on the starting characteristics, since the motor-fan start had significantly less impact on the system than even the slightly smaller, unloaded 1/6 HP motor. The motor-fan voltage vs current, Figure 5-11.f, shows

the first second of the starting event in which the motor is still accelerating. Also shown is 4 cycles of data taken 1 to 2 seconds later. This indicates that the motor-fan took more than 1 sec. to approach rated speed, but steady operation was achieved in 1 to 2 seconds. Also, the running current amplitude dropped to less than half of the peak starting current.

6.0 Conclusions and Recommendations

The transient tests of NASA's SPRE represent a significant accomplishment in the development of a useable, stand-alone Stirling power system. The tests showed that the control system could maintain constant long term voltage and stable periodic operation over a large range of engine operating parameters and for various loads. However, modest resistive load changes were shown to cause relatively large voltage and, hence, piston and displacer amplitude excursions. Also, the starting current and characteristics of typical small induction motors were shown to cause large and, in some cases, deleterious voltage transients. The tests underlined the fact that for a stand-alone power system, FPSE/LAs need either more effective controls or a power conditioning system which isolates the FPSE/LAs from load transients.

Given the computational capability of state-of-the-art digital control systems, it is probable that an advanced parasitic load control could be developed. Such a control can substantially reduce or eliminate voltage transients in FPSE/LA power systems due to user load transients.

Perhaps the greatest contribution these tests have made to the FPSE/LA technology is that they provide a large body of transient dynamic data for a well documented engine. The data will be useful for validation of transient and dynamic analyses.

The following are specific conclusions and recommendations for furthering the understanding of a FPSE/LA power system.

In the course of planning the SPRE Load Interaction Tests and designing improved load controls for the test facility, a simplified non-linear model of the FPSE/LA and controls was developed. A resistive parasitic load control and a resistive auxiliary load were modelled. The behavior of the system model was qualitatively similar to the measured dynamics. However, detailed quantitative comparisons have not been made. The model was used to evaluate various control parameters. Which parameters were not optimized over the full range of engine operating conditions. Finally, a similar model developed for another project has shown that the addition of derivative feedback can substantially reduce voltage overshoot. Future analytic tasks relating to the general FPSE/LA system model include:

- Validation of the model, using resistive transient data. Improvements to the FPSE/LA system model may be necessary to obtain reasonable agreement.
- Evaluation of the addition of derivative feedback to improve short term transient response.
- Optimization of feedback control parameters for the full range of FPSE/LA operating conditions.

It will be valuable to follow-up predicted improvements with experimental verification. Also, testing of various combinations of control parameters and alternative algorithms would be facilitated by replacing the current analog-digital voltage control with a digital computer control. Experimental tasks relating to the general understanding of FPSE/LA system transient behavior and controls include:

- Replacement of hybrid analog-digital control with digital computer control.
- Testing of refined and optimized control identified in the analytic tasks.

Some of the more dramatic and, therefore, interesting tests involved starting the various motors. The tests showed that the system behavior for various motors of similar power rating could be quite different. Analytic tasks relating to the interaction of motors with the FPSE/LA system include:

- Modeling the transient electro-mechanical dynamics of the FPSE/LA-motor system. In general, this will require characterization of the various motors.
- Validation of the models, using motor transient data.

These tests treated the motors as "black boxes," and only the supply voltage and current were measured. Instrumentation for motor speed, torque and start coil current could improve understanding of system interactions. Experimental tasks relating to the interaction of motors with FPSE/LA systems include the following:

- Improved motor instrumentation. Speed and start coil current measurements could be easily added to the test motor(s). The speed transducer should have a continuous output, measurable with a high-speed TDAS channel. Motor torque measurement would also be a useful, but relatively costly addition.
- Motor tests, particularly of the 1/5 HP motor-fan, would benefit from taking data with a time window of 2 to 3 sec. compared to 1 sec. used-to-date. This is within the capability of the PC/TDAS hardware and would only require minor software changes.
- Test 1/3 and 1/6 HP motors with the start switch jumper closed. This will eliminate the disruption of disconnecting the start coil from the transient. A further option will be to manually disconnect the start coil after the system has stabilized. These tests would separate the effects of the control response from the influence of the start coil discontinuity, observed in the tests described earlier.

References

- Cairelli, J.E., et al., "Results from Baseline Tests of the SPRE I and Comparison with Code Model Predictions", NASA TM-102044, 1989.
- Cairelli, J.E., et al., "Update on Results of SPRE Testing at NASA Lewis", NASA TM-104425, 1991.
- Cairelli, J.E., et al., "Update on Results of SPRE Testing at NASA Lewis", Proc. 25th IECEC, Vol 5, pp 237-244, 1991.
- Cairelli, J.E., "SPRE I Free-Piston Stirling Engine Testing at the NASA Lewis Research Center", NASA TM-100241, 1988.
- Dochat, G., "SPDE/SPRE Final Summary Report", NASA CR-187086, 1991.
- Geng, S.M., Tew, R.C., "Comparison of GLIMPS and HFAST Stirling Engines Code Predictions with Experimental Data", Proc. 27th IECEC, Vol. 5, pp 53-58, NASA TM-105549, 1992.
- Huang, S.C., "HFAST: A Harmonic Analysis Program for Stirling Cycles", Proc. 27th IECEC, Vol. 5, pp 47-52, 1992.
- Kankam, M.D., and Rauch, J.S., "Comparative Survey of Dynamic Analyses of Free-Piston Stirling Engines," Proc. 26th IECEC, August, Vol. 5, pp 314-319, 1991, NASA TM-104491.

- Kankam, M.D., and Rauch, J.S., "Controllability of Free-Piston Stirling Engine/Linear Alternator Driving a Dynamic Load", Proc. 28th IECEC, Vol. 2, pp 937-943, 1993, NASA TM-106497.
- Kankam, M.D., and Rauch, J.S., "Dynamic Analysis of Free-Piston Stirling Engine/Linear Alternator- Load System: Experimentally Validated," Proc. 27th IECEC, August, Vol. 5, pp 315-323, 1992, NASA TM-106034.
- Rauch, J.S., et al., "A Free-Piston Stirling Engine/Linear Alternator Controls and Load Interaction Test Facility", Proc. 27th IECEC, Vol. 5, pp 309-314, 1992, NASA TM-105825.
- Wong, W.A., et al., "NASA Lewis Stirling SPRE Testing and Analysis with Reduced Number of Cooler Tubes", NASA TM-105767, 1992.
- Cairelli, J. E., et al., "1993 Update to Results of SPRE Testing at NASA Lewis", Proc. 28th IECEC, 1994, Vol. 2, pp 633-638.

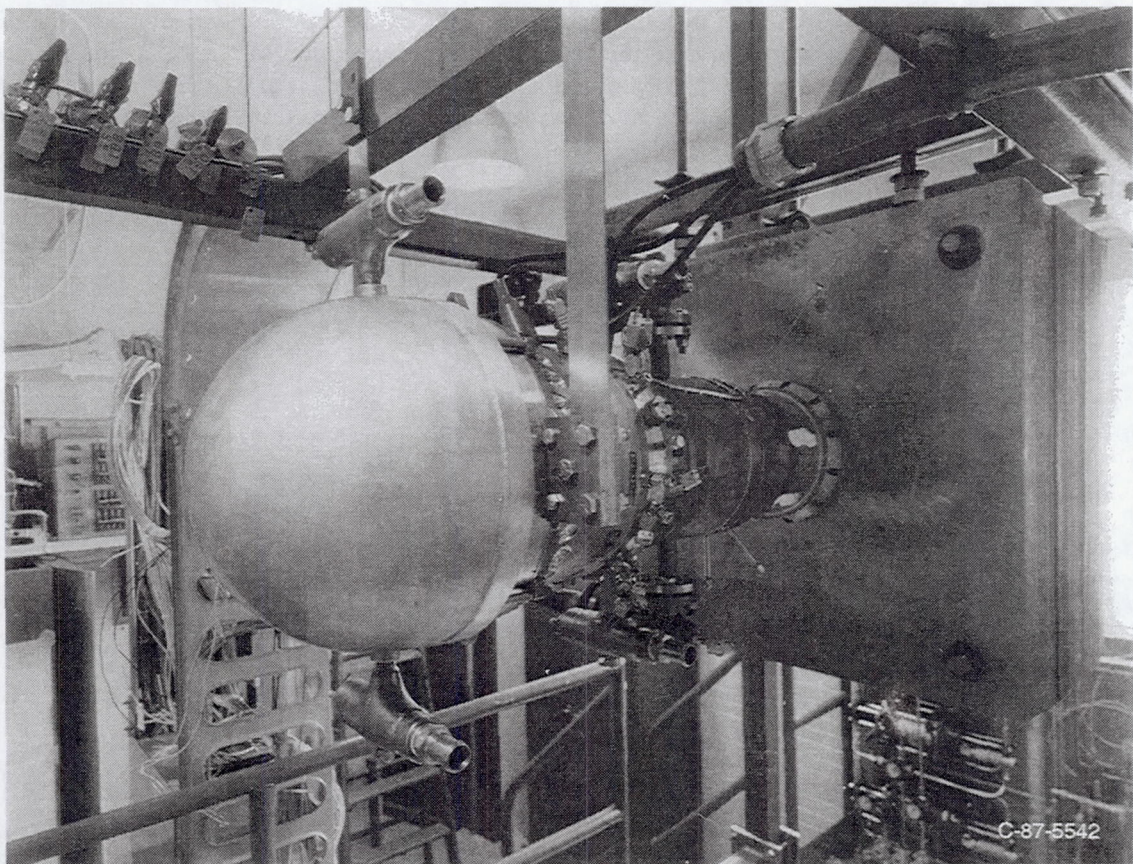


Fig. 2-1.—SPRE installed at NASA LeRC.

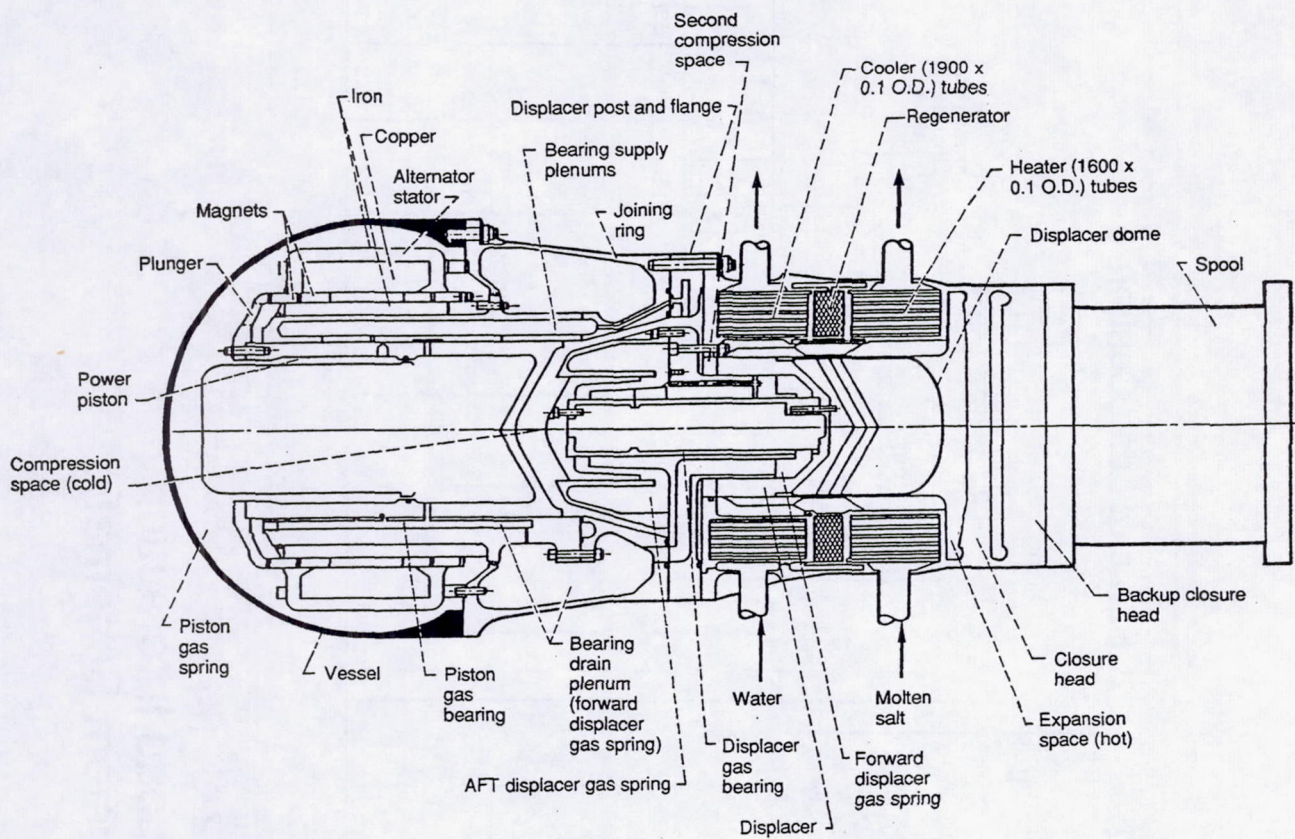


Fig. 2-2.—Cross-section of Space Power Research Engine.

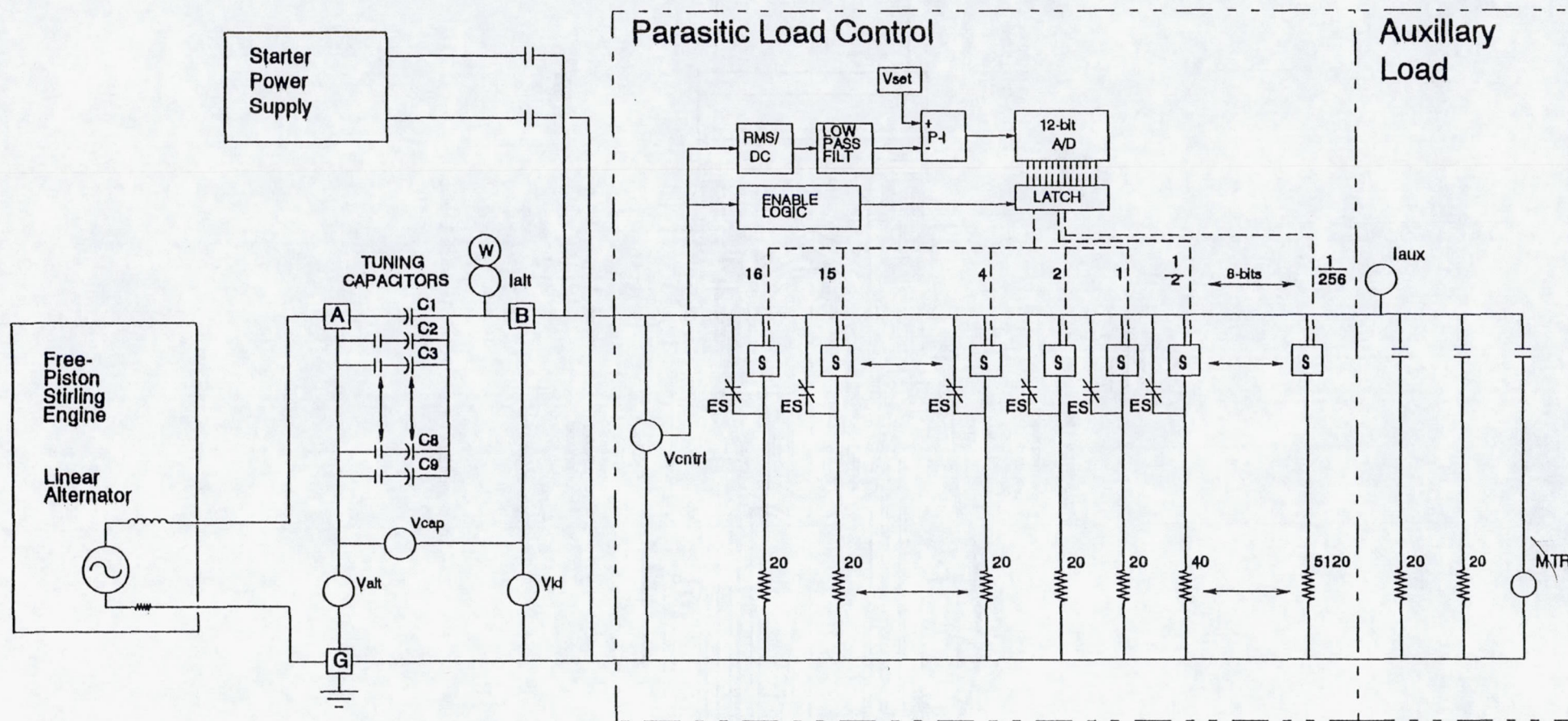


Figure 2-3
SPRE Load Interaction
Test System Schematic

PC / Transient Data Acquisition System

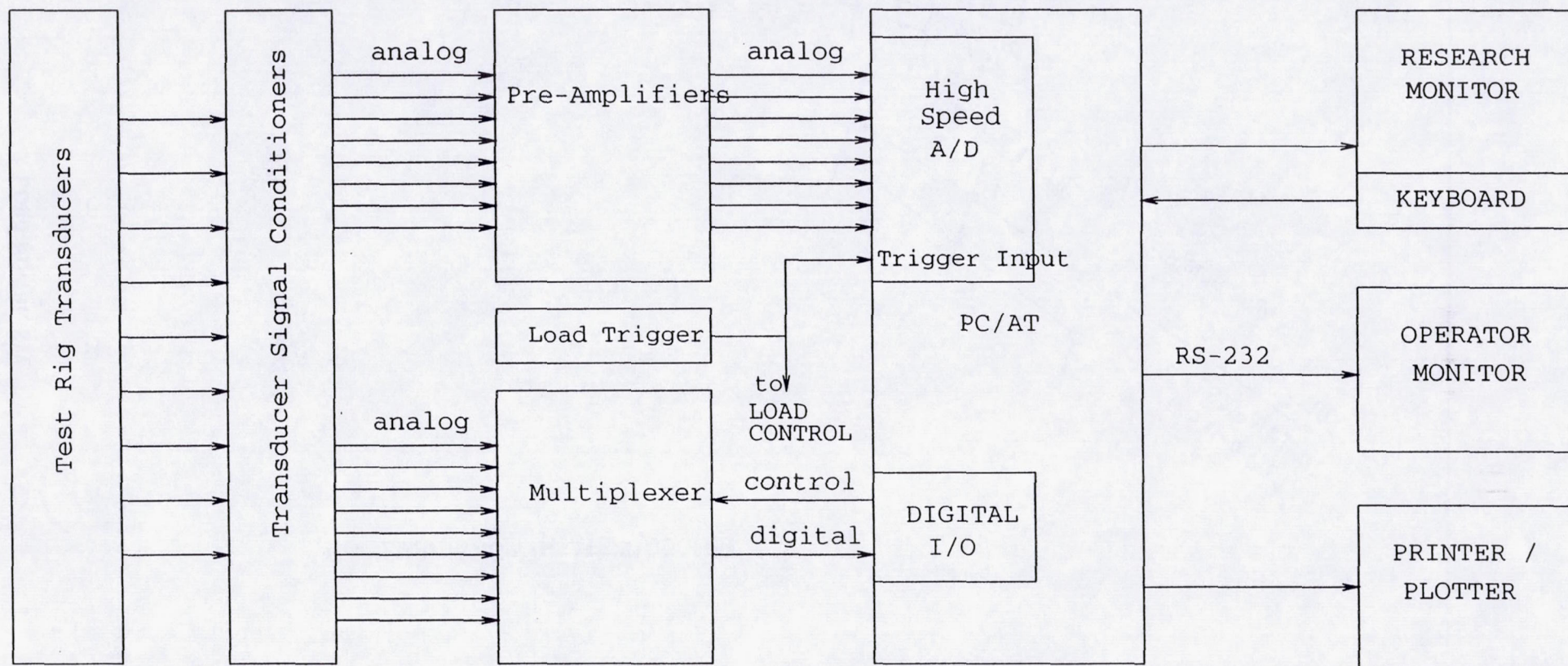


Figure 2-4

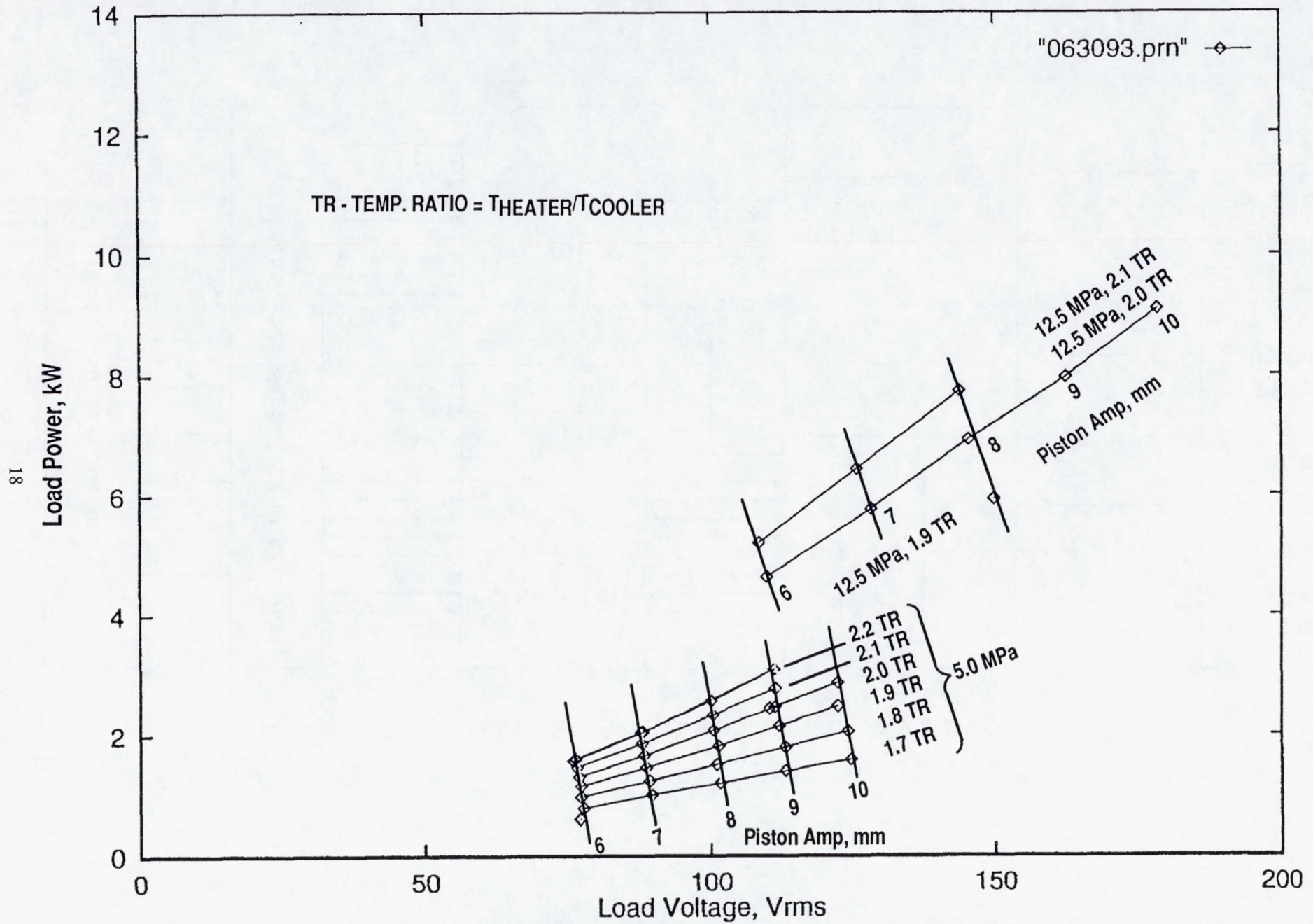


Figure 4-1a

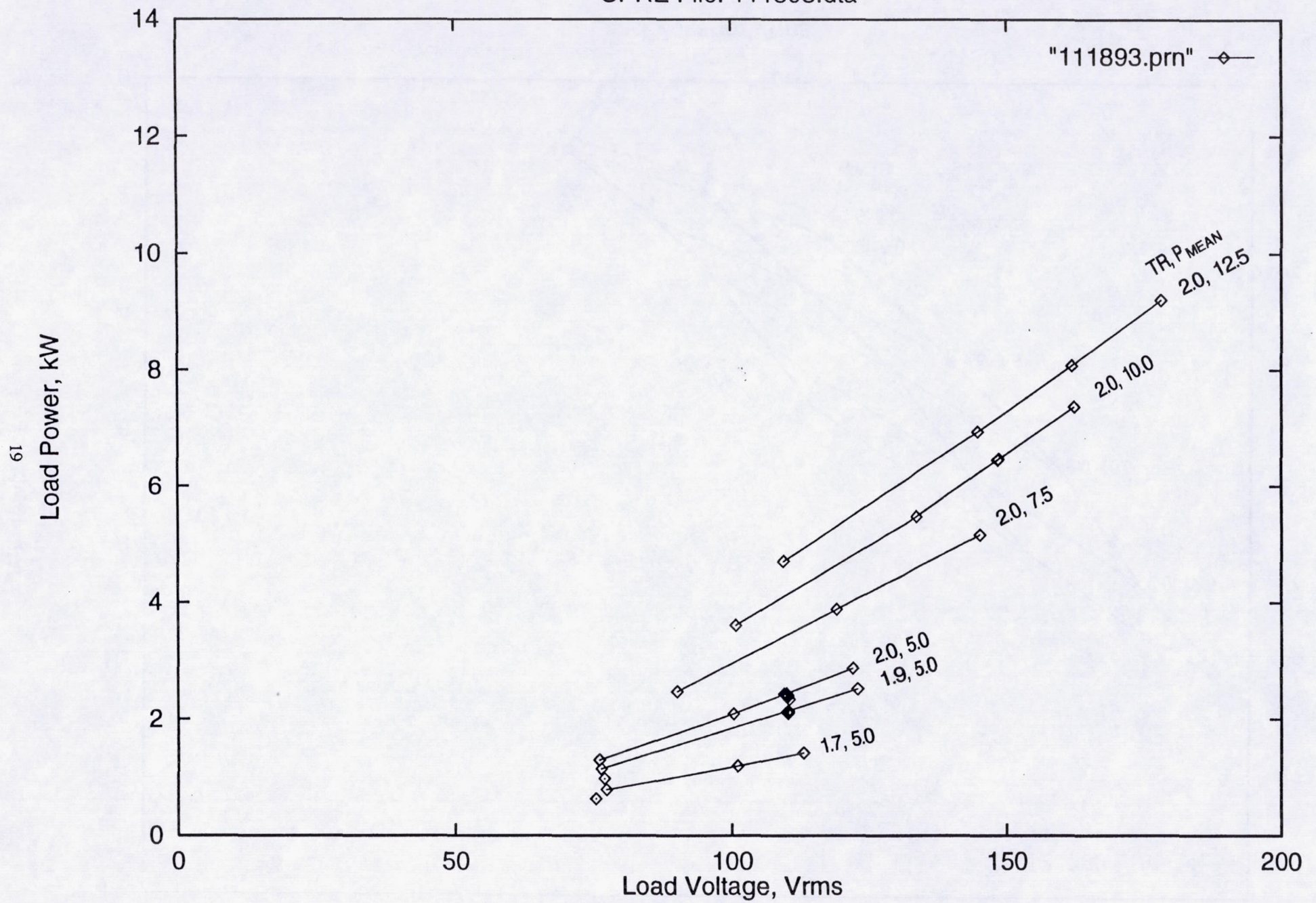


Figure 4-1b

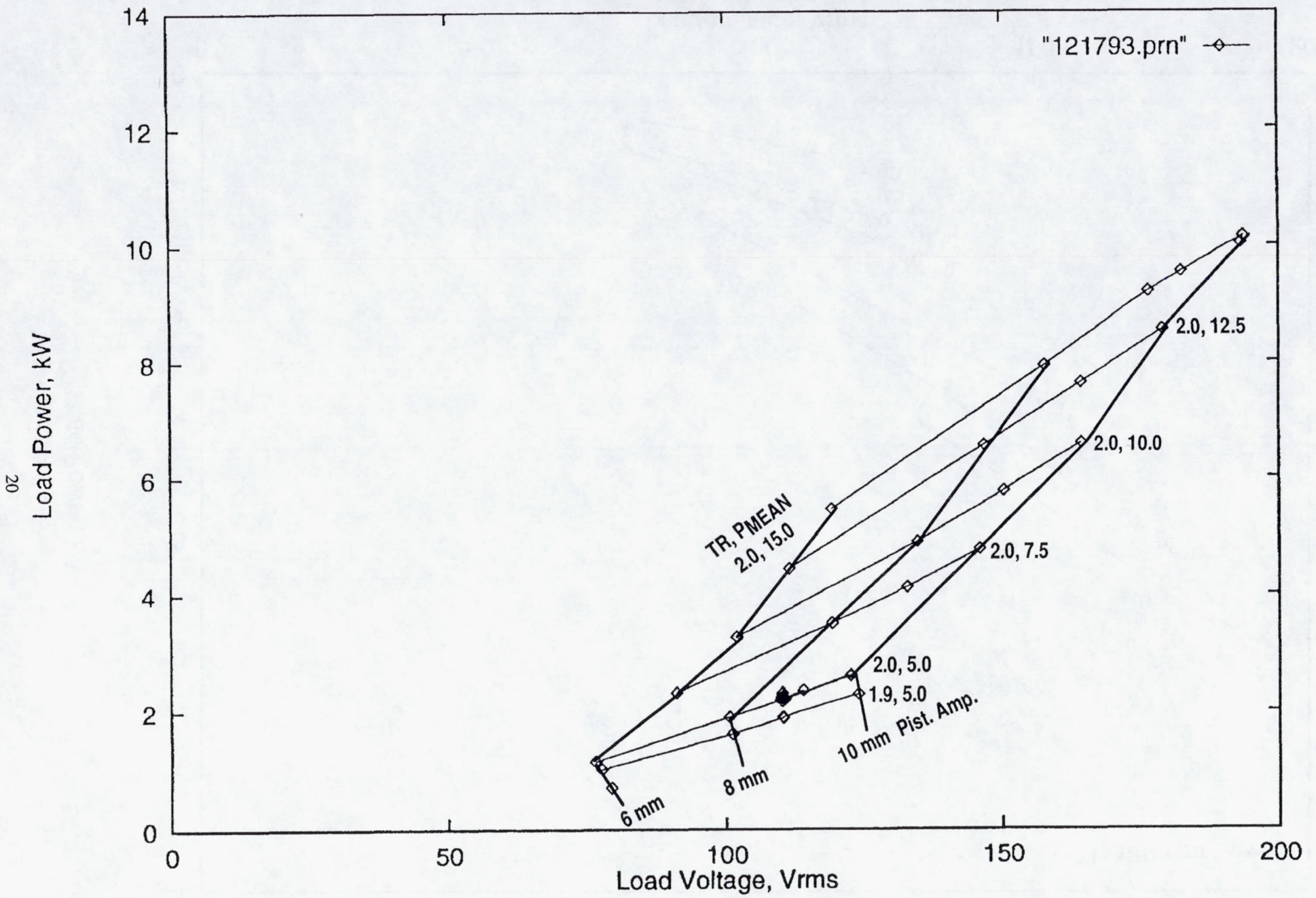


Figure 4-1c

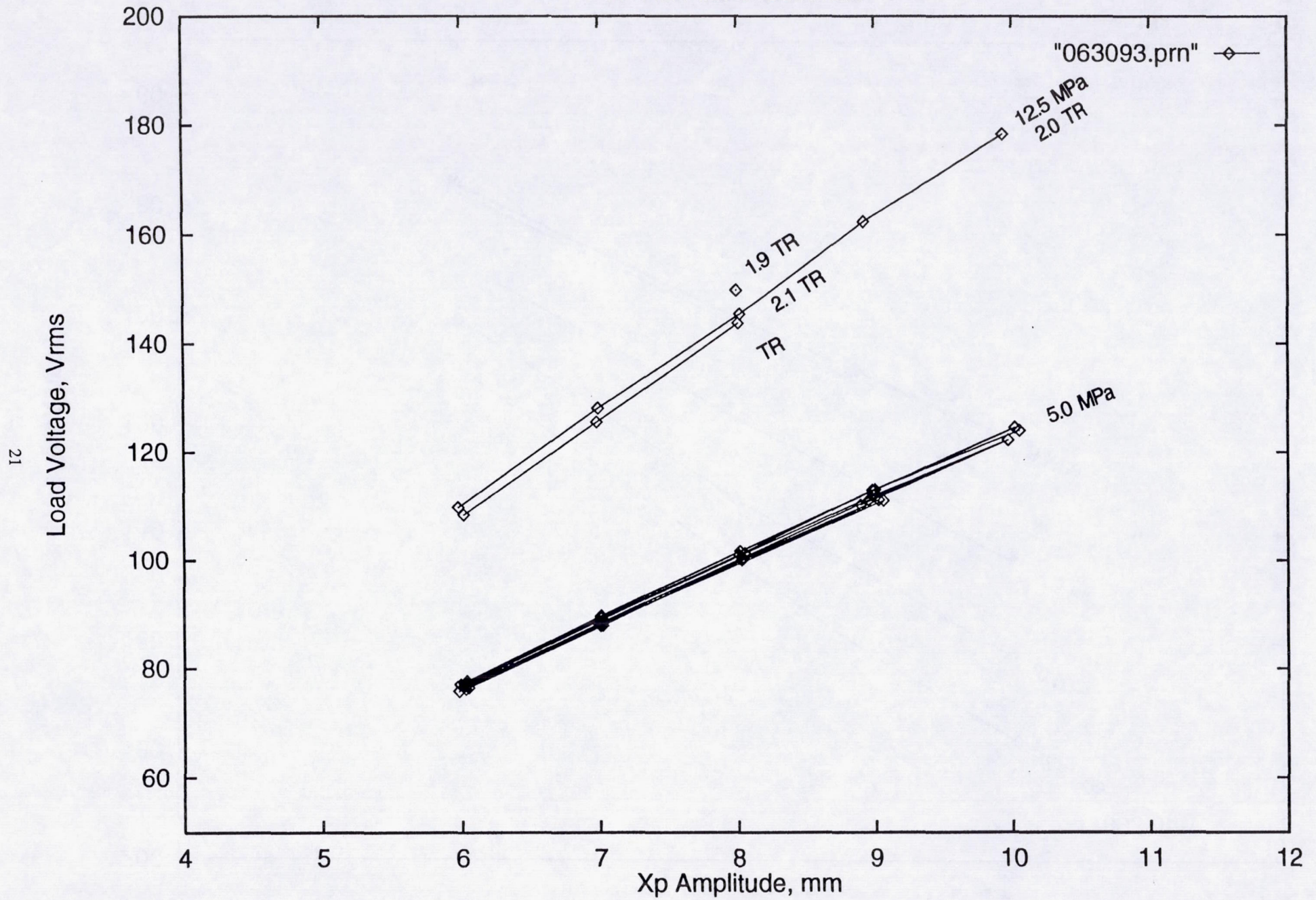
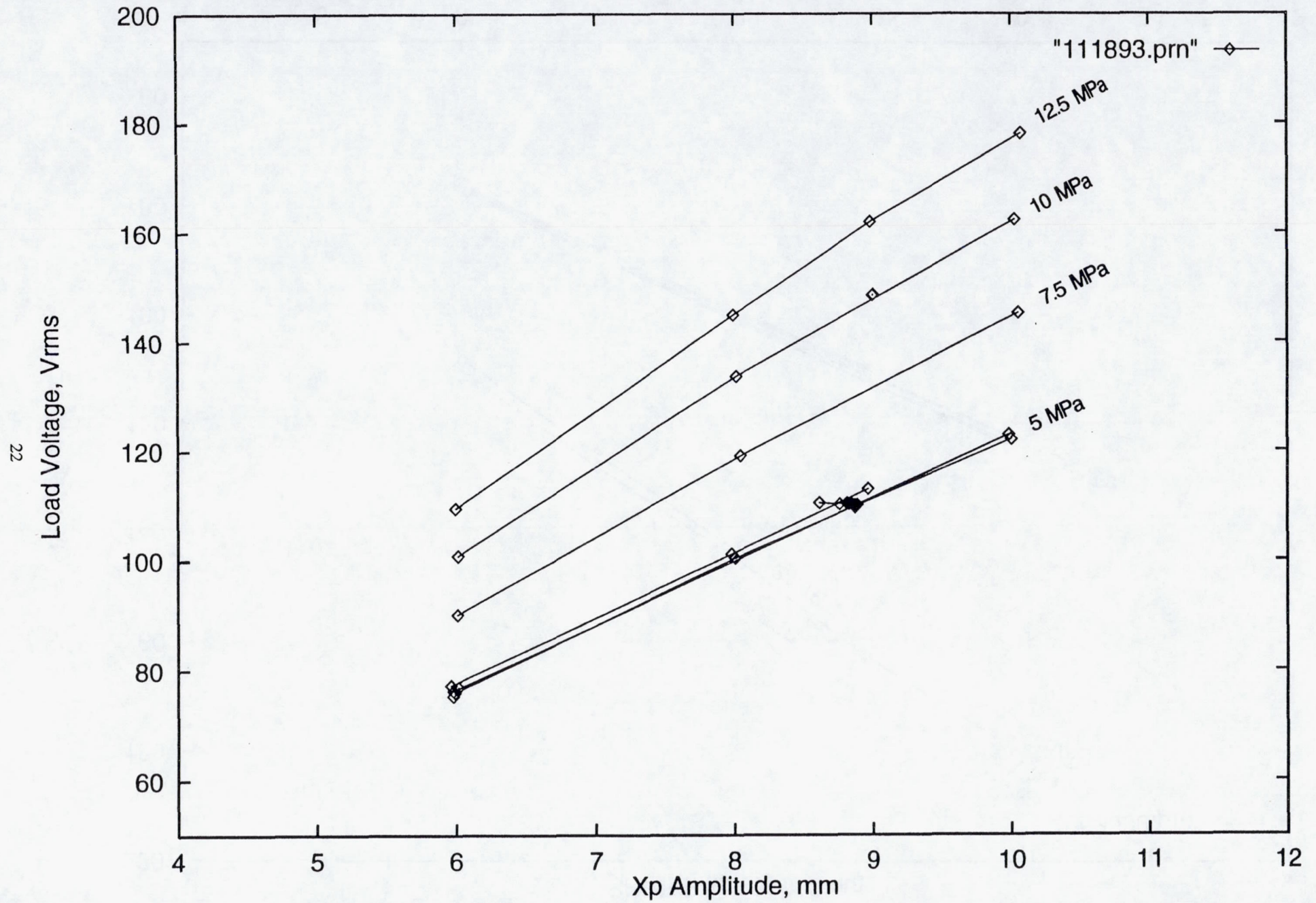


Figure 4-2a



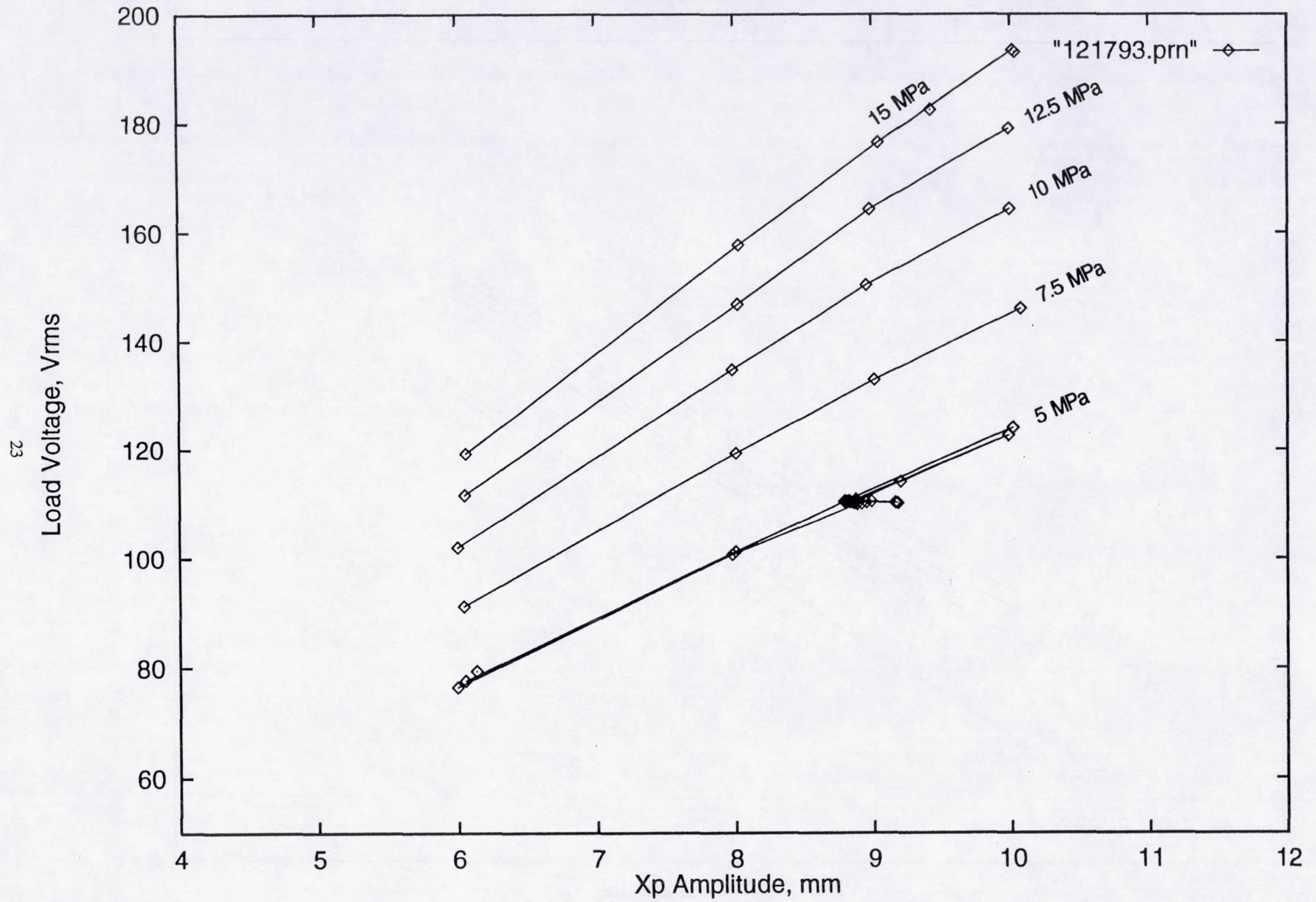
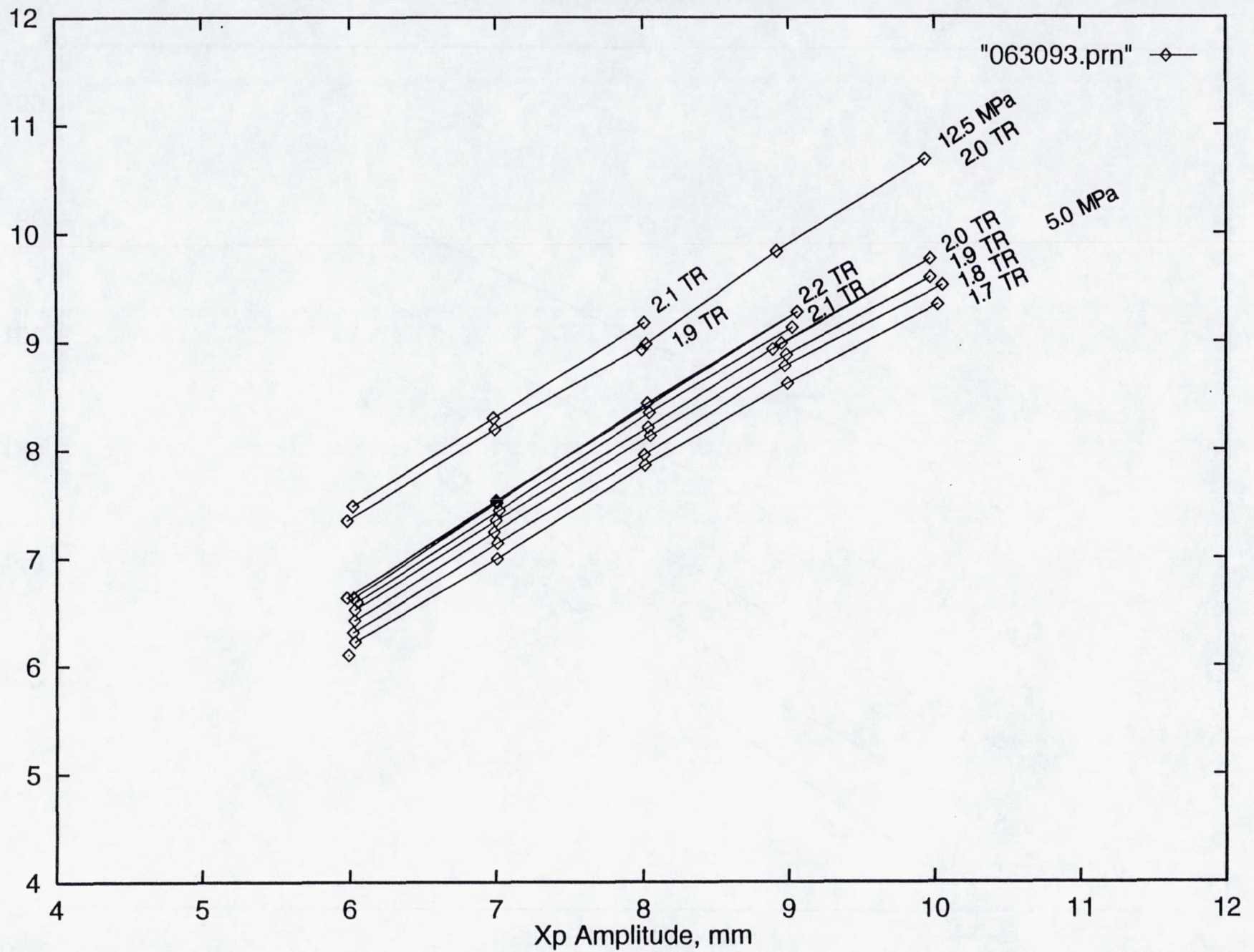


Figure 4-2c

Xd Amplitude, mm



Xd Amplitude, mm

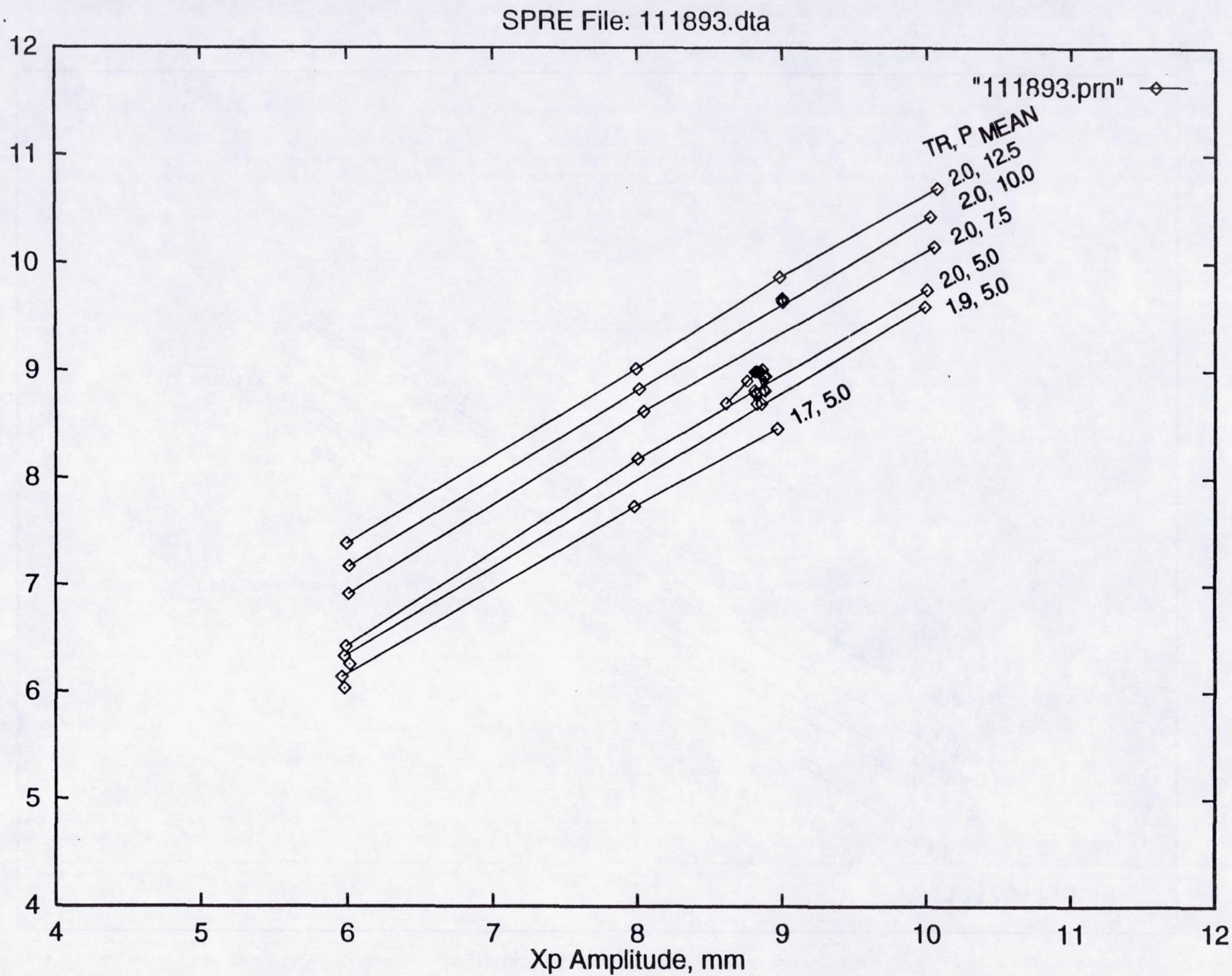
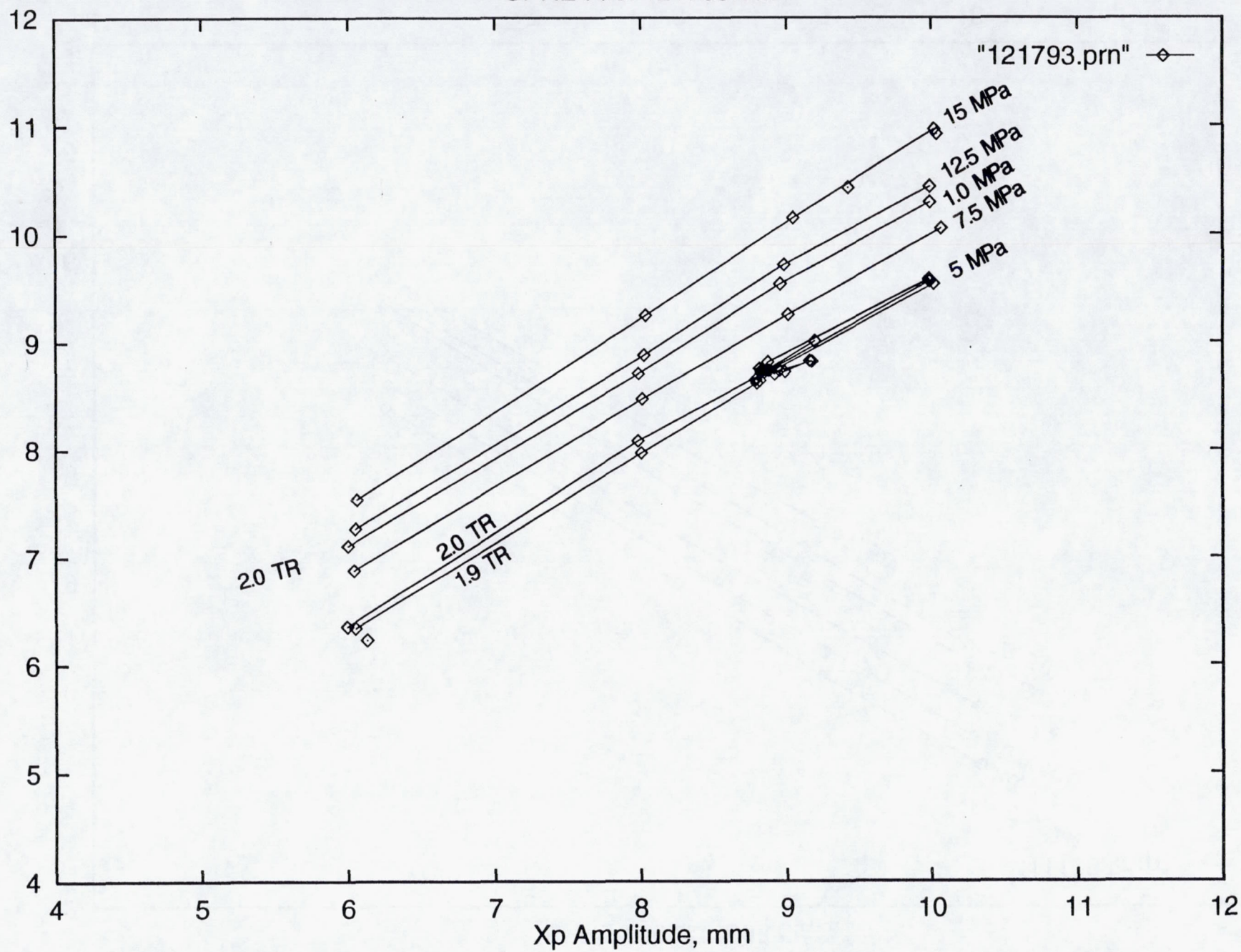


Figure 4-3b



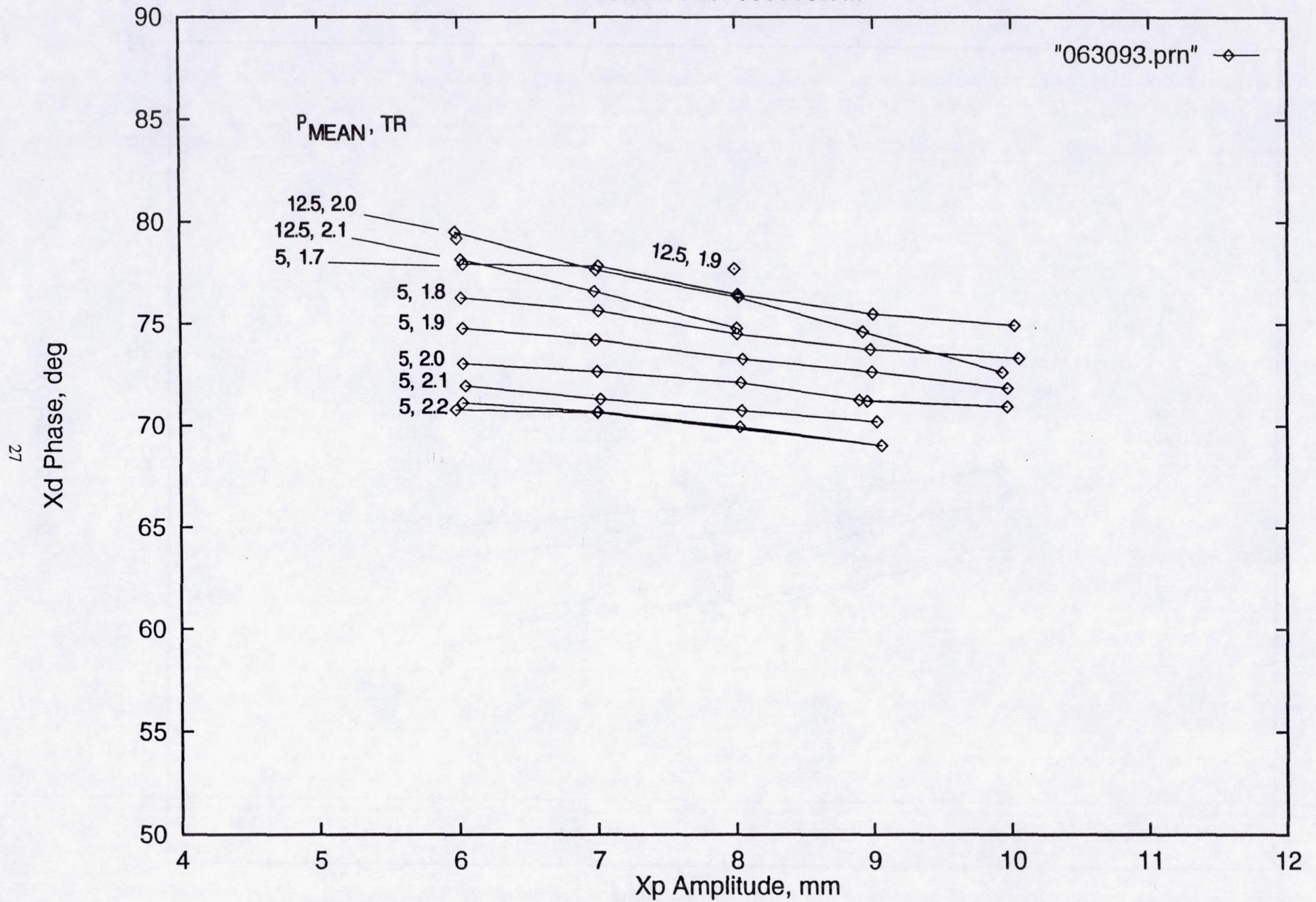
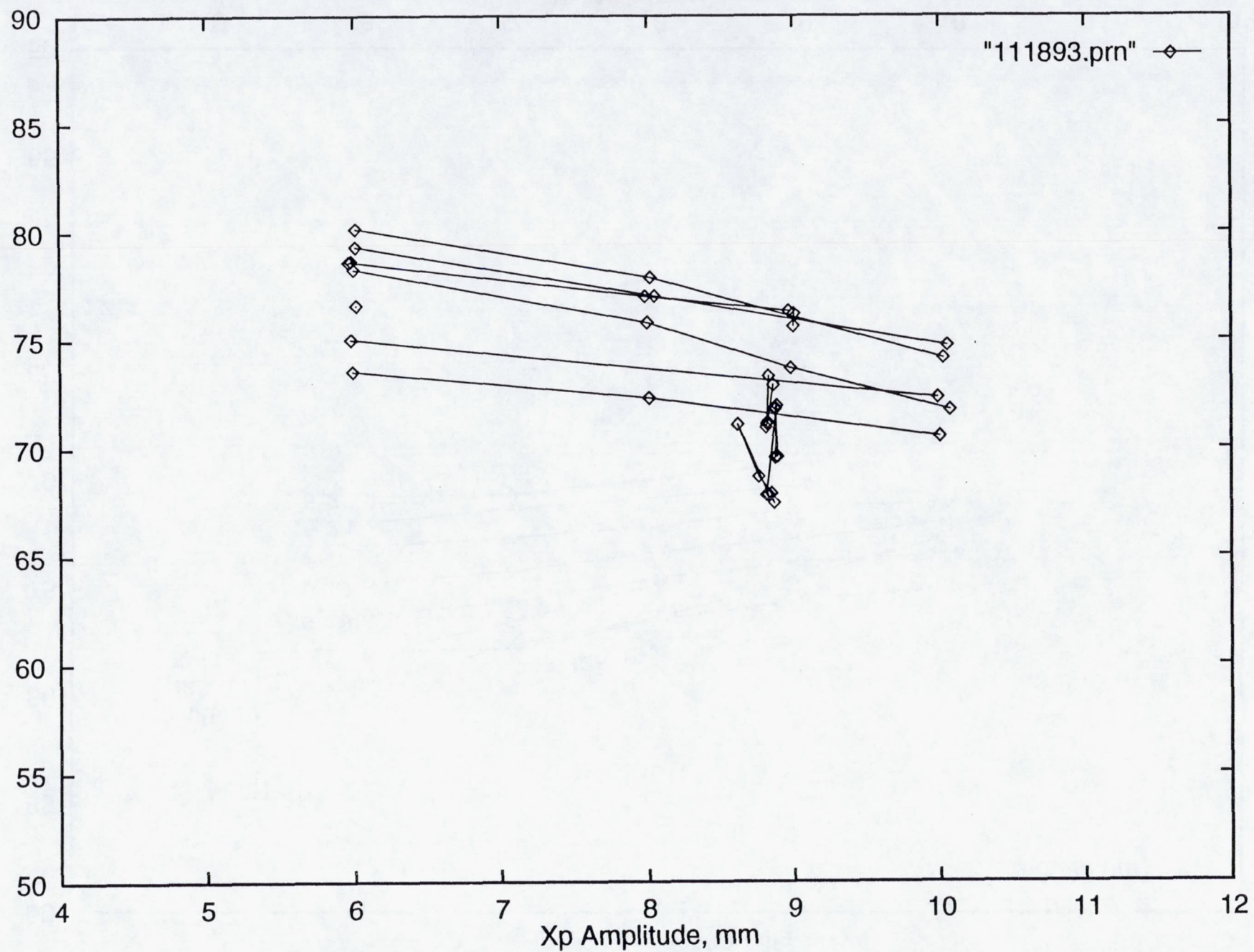


Figure 4-4a

SPRE File: 111893.dta



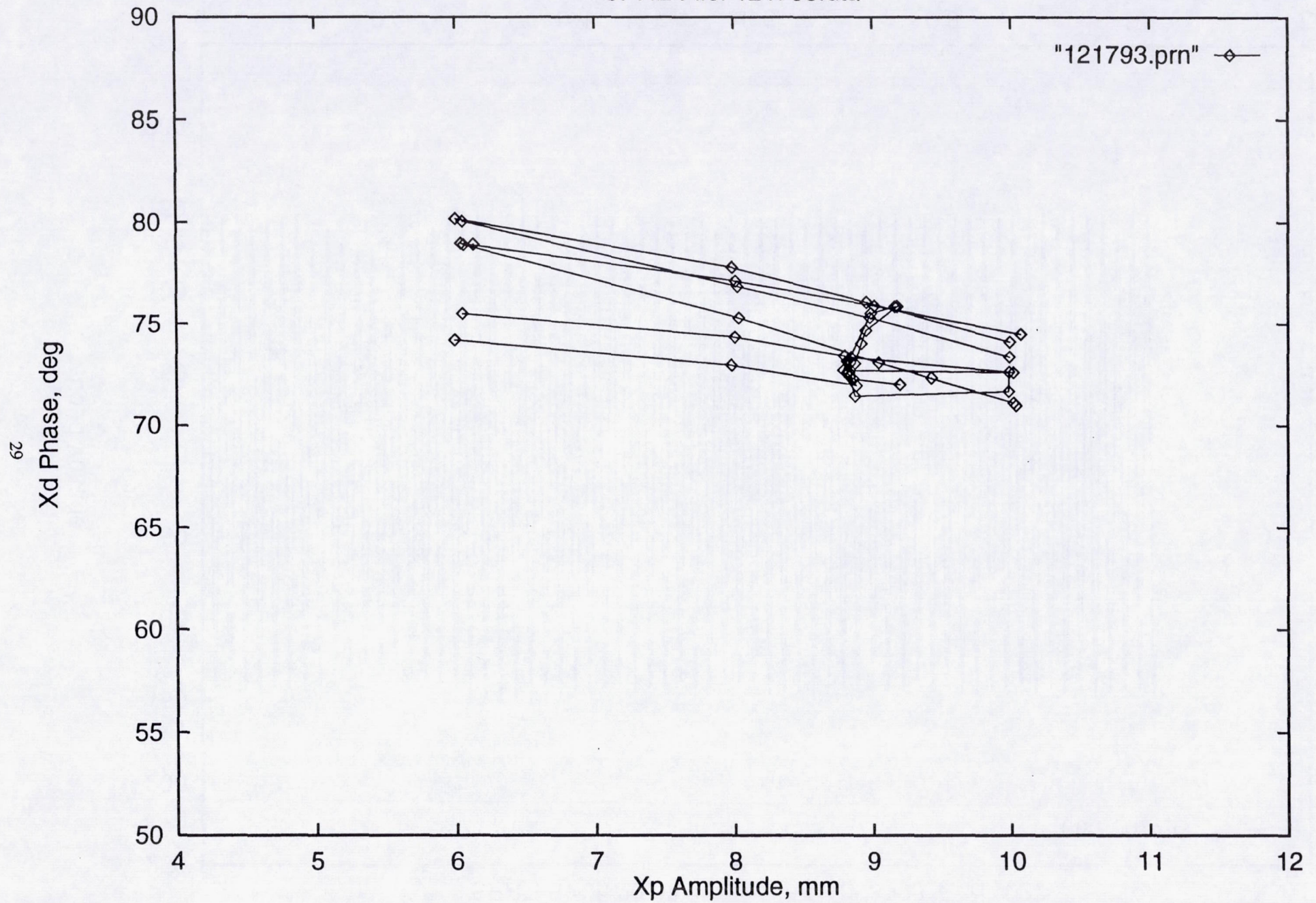
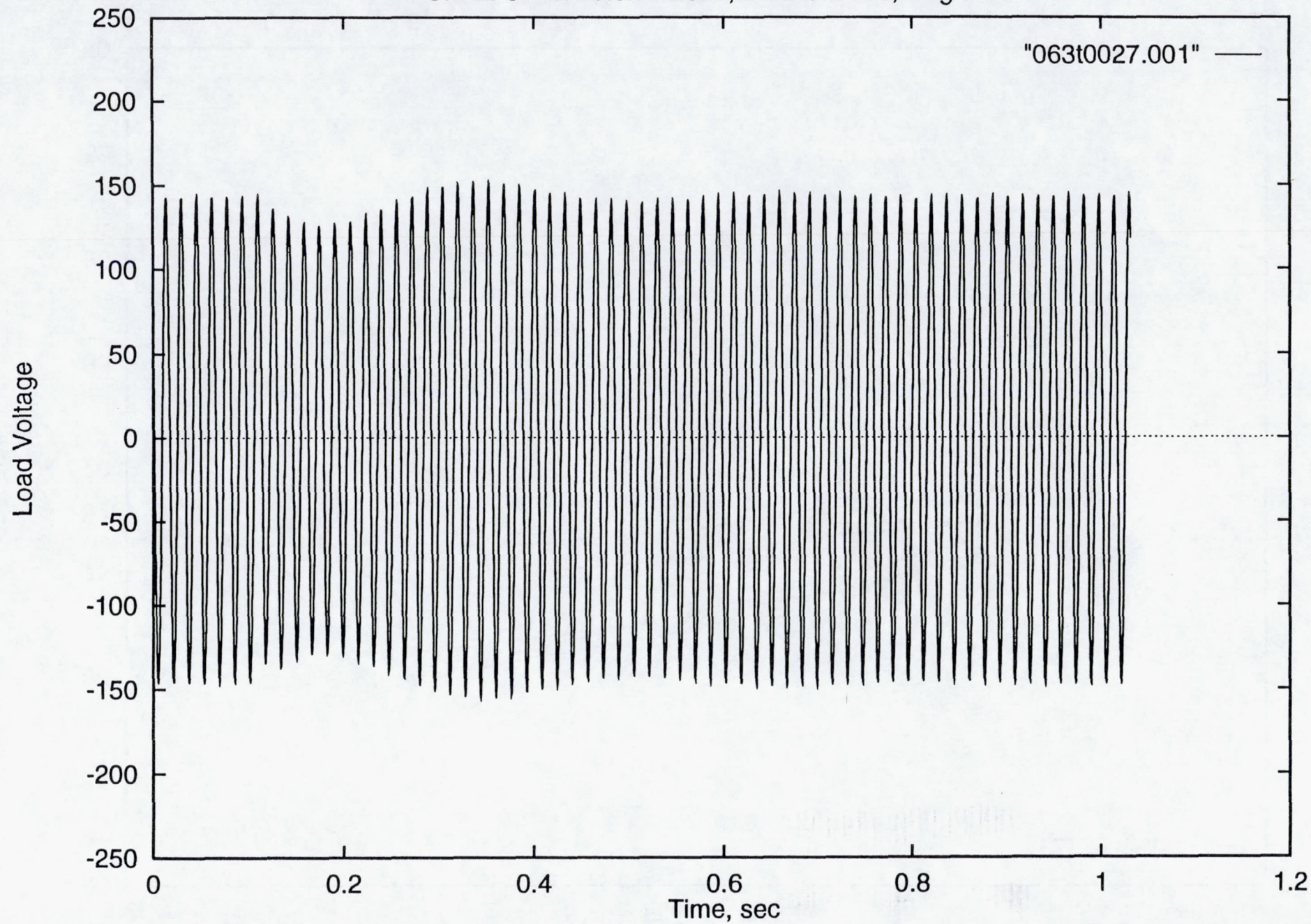


Figure 4-4c

SPRE Sw In 20.ohm Load; File: 063093, Rdg 0027



Aux Load Current, Amps

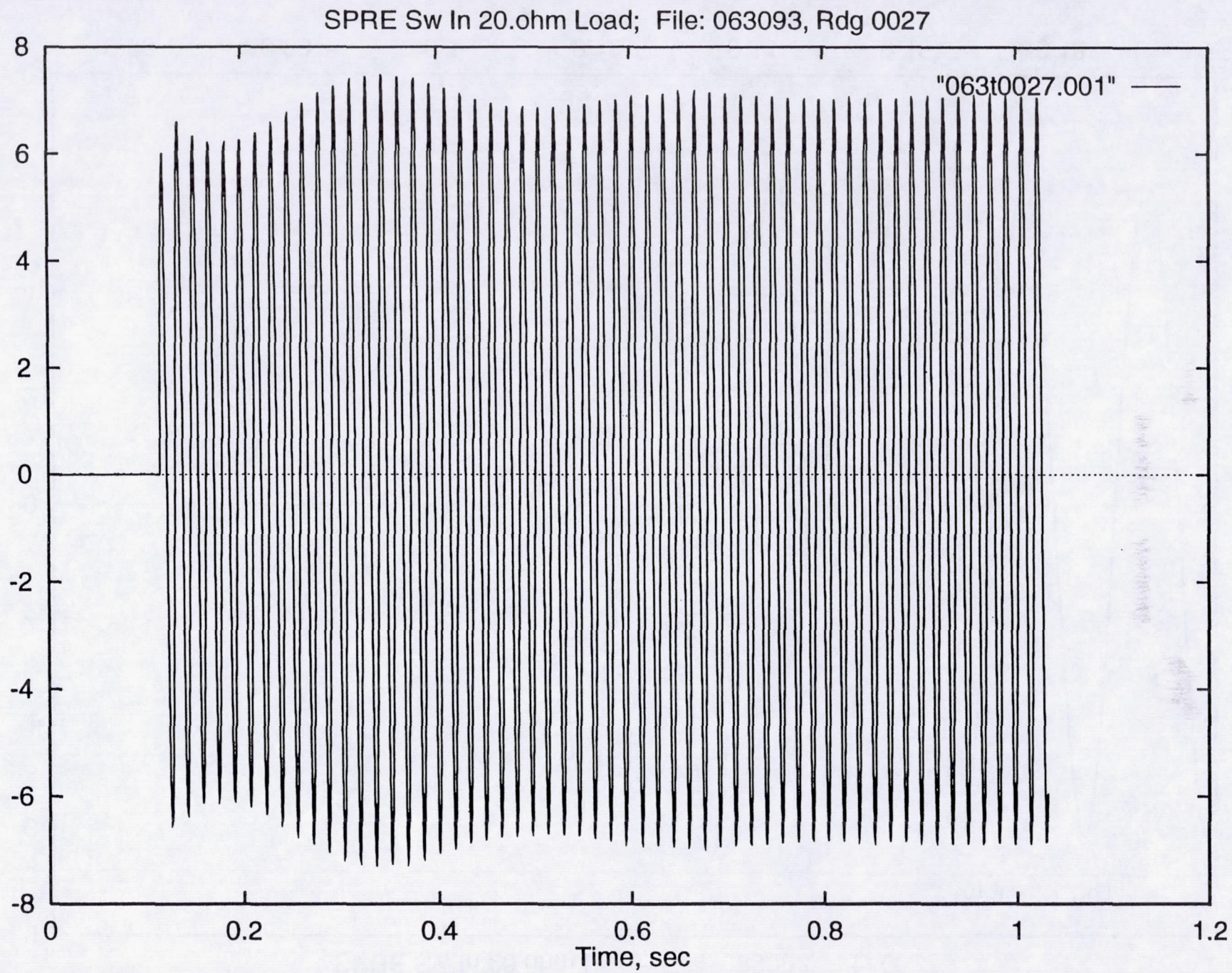
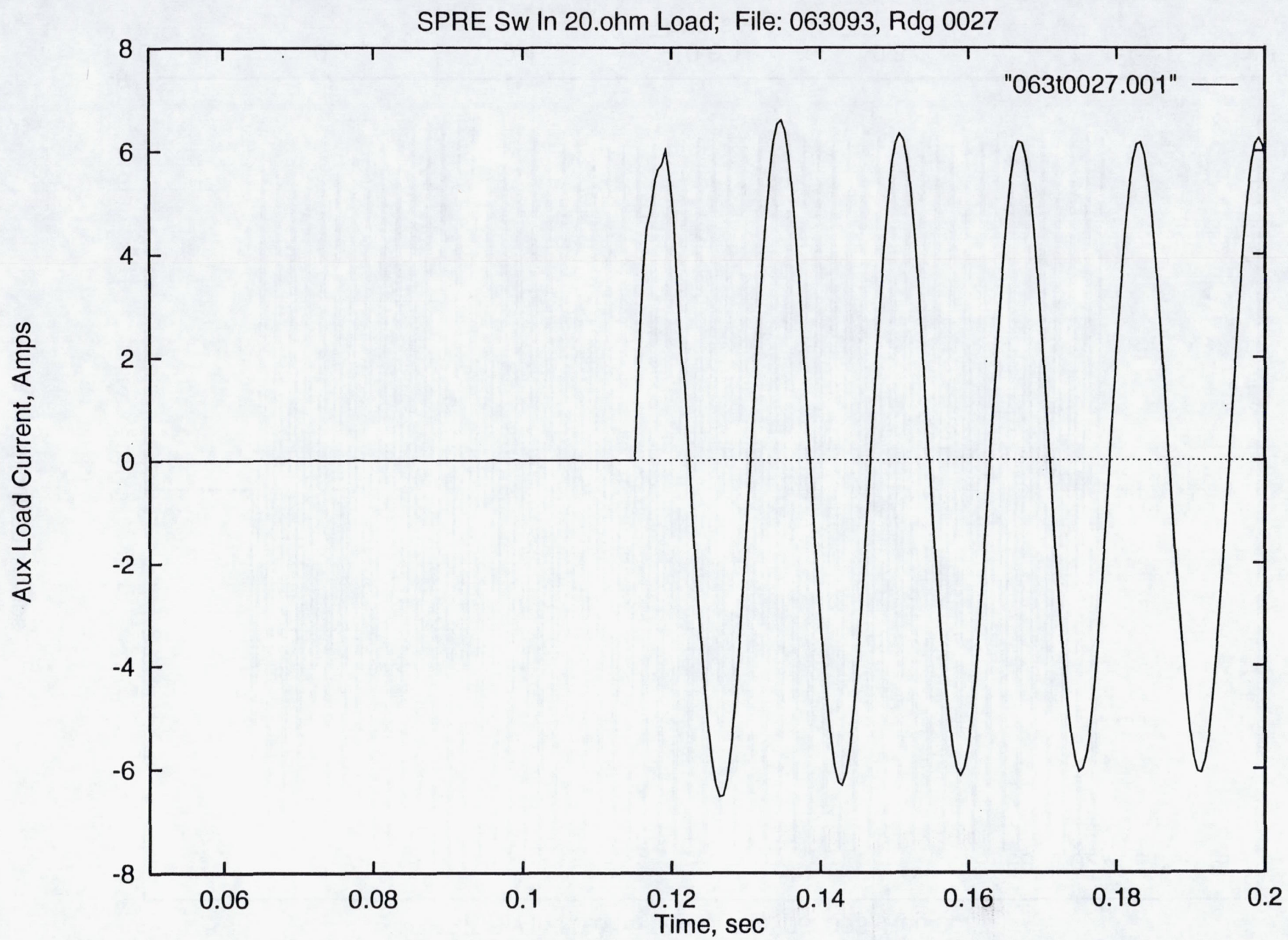


Figure 5-1b



Total Current, Amps

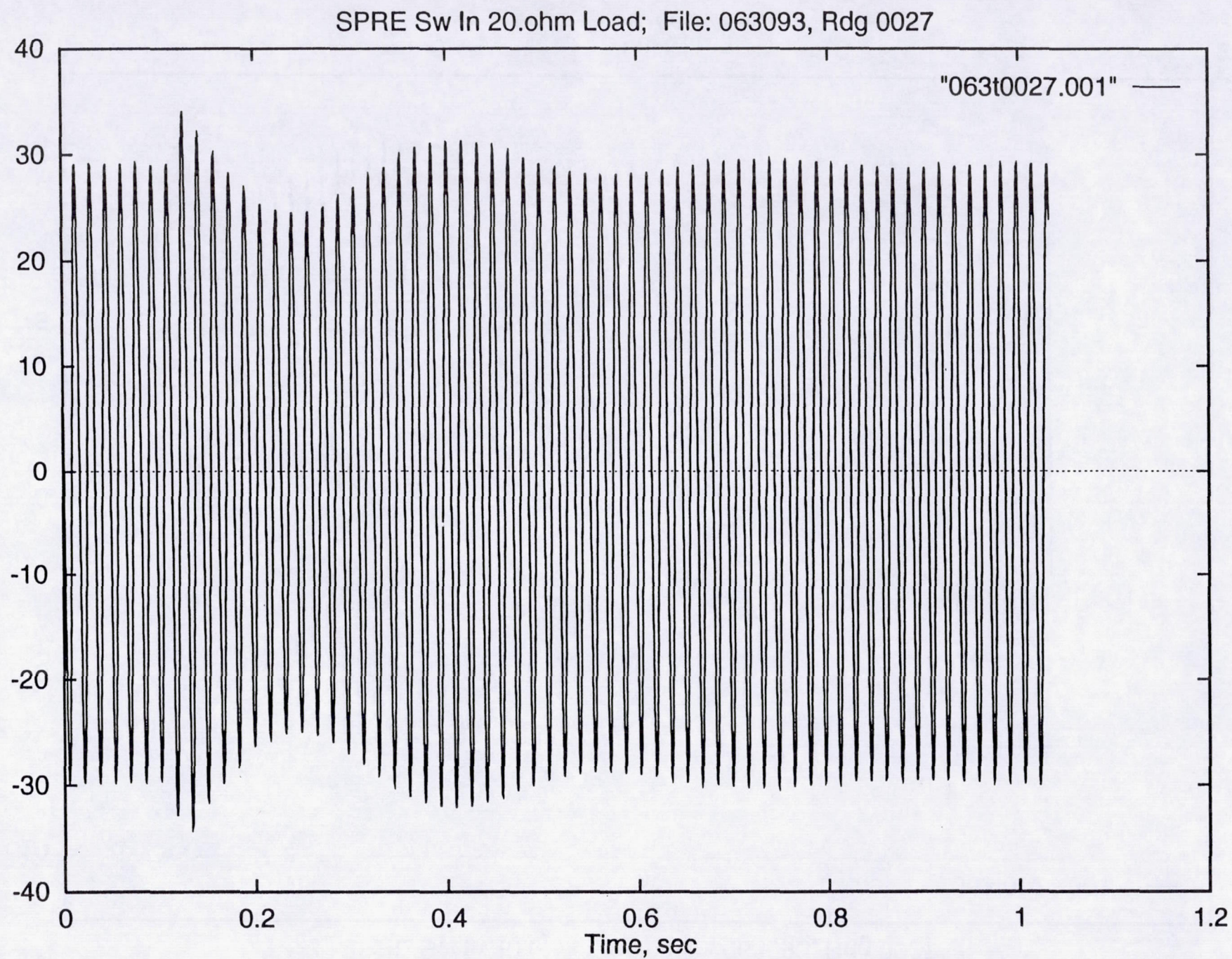
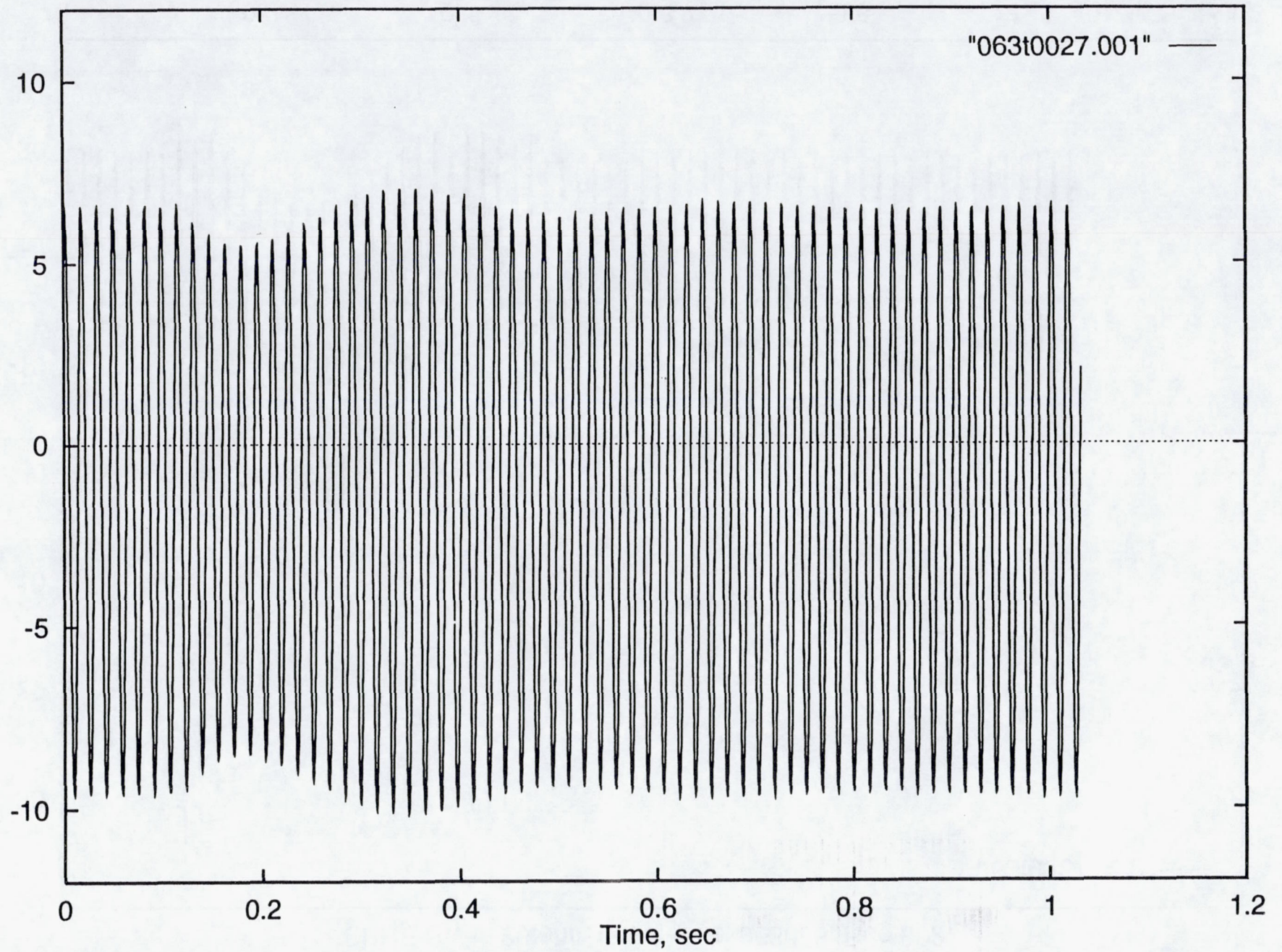


Figure 5-1d

SPRE Sw In 20.ohm Load; File: 063093, Rdg 0027



35
Displacer Position, mm

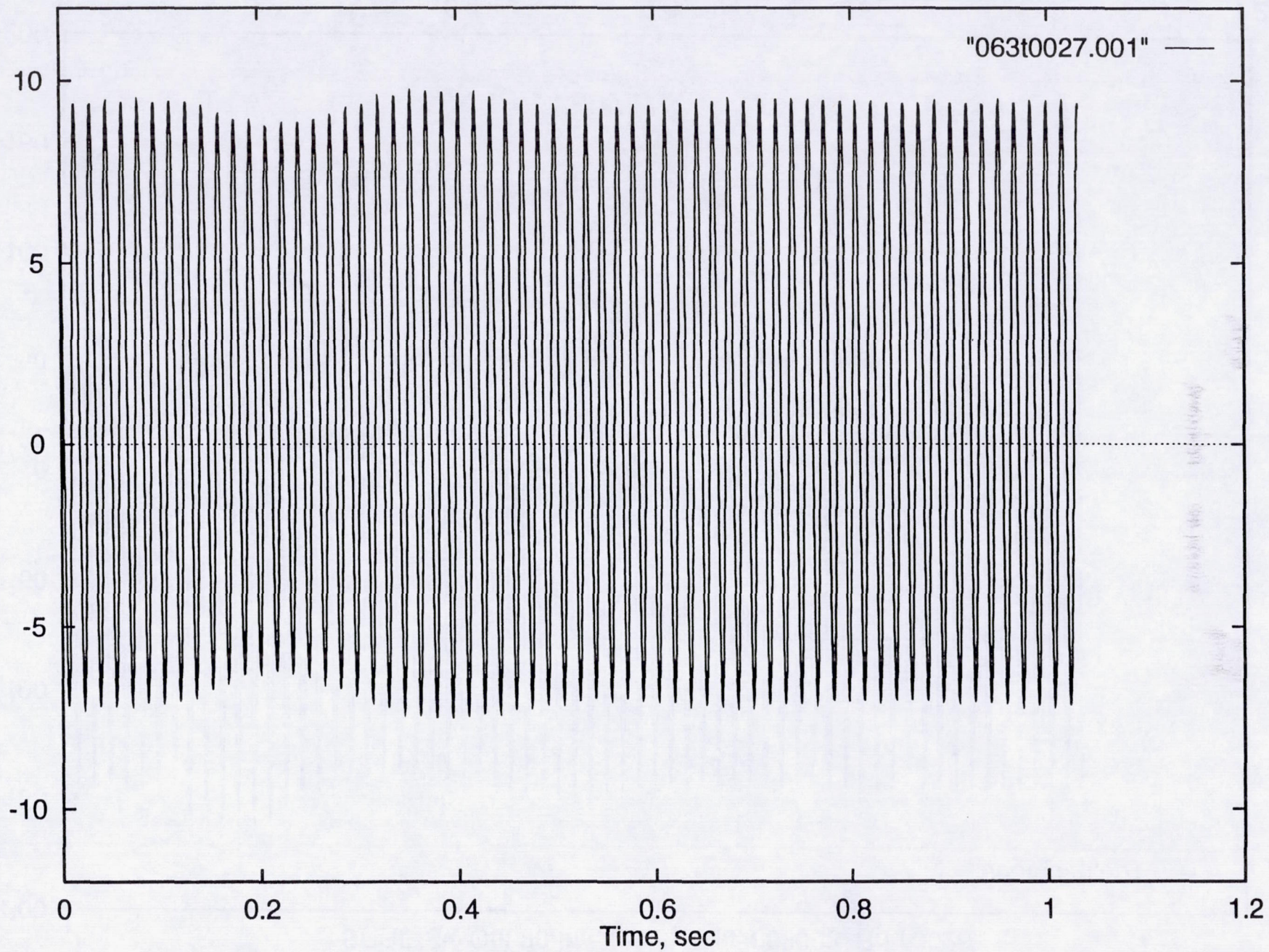
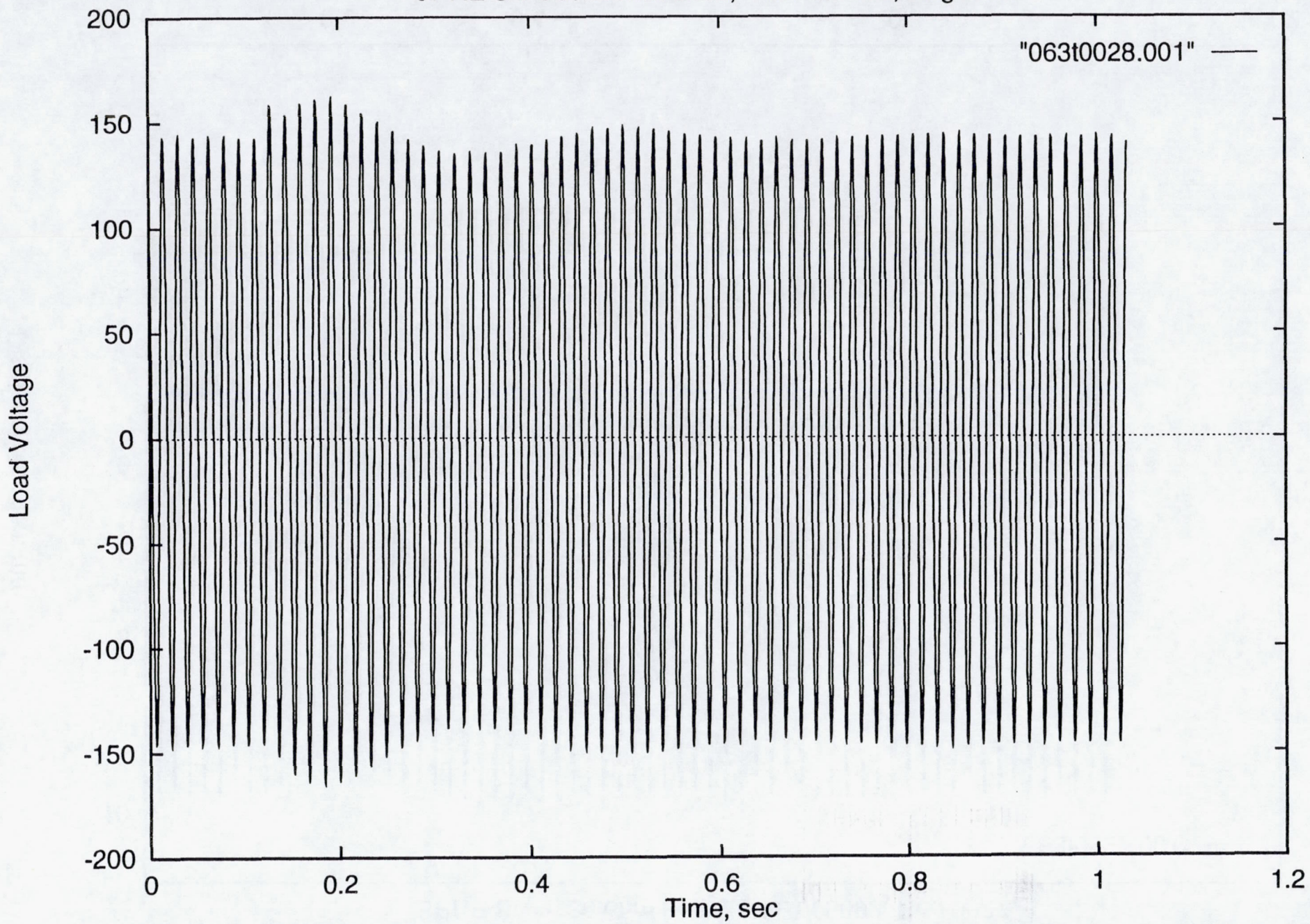


Figure 5-1f

SPRE Sw Out 20ohm Load; File: 063093, Rdg 0028



Total Current, Amps

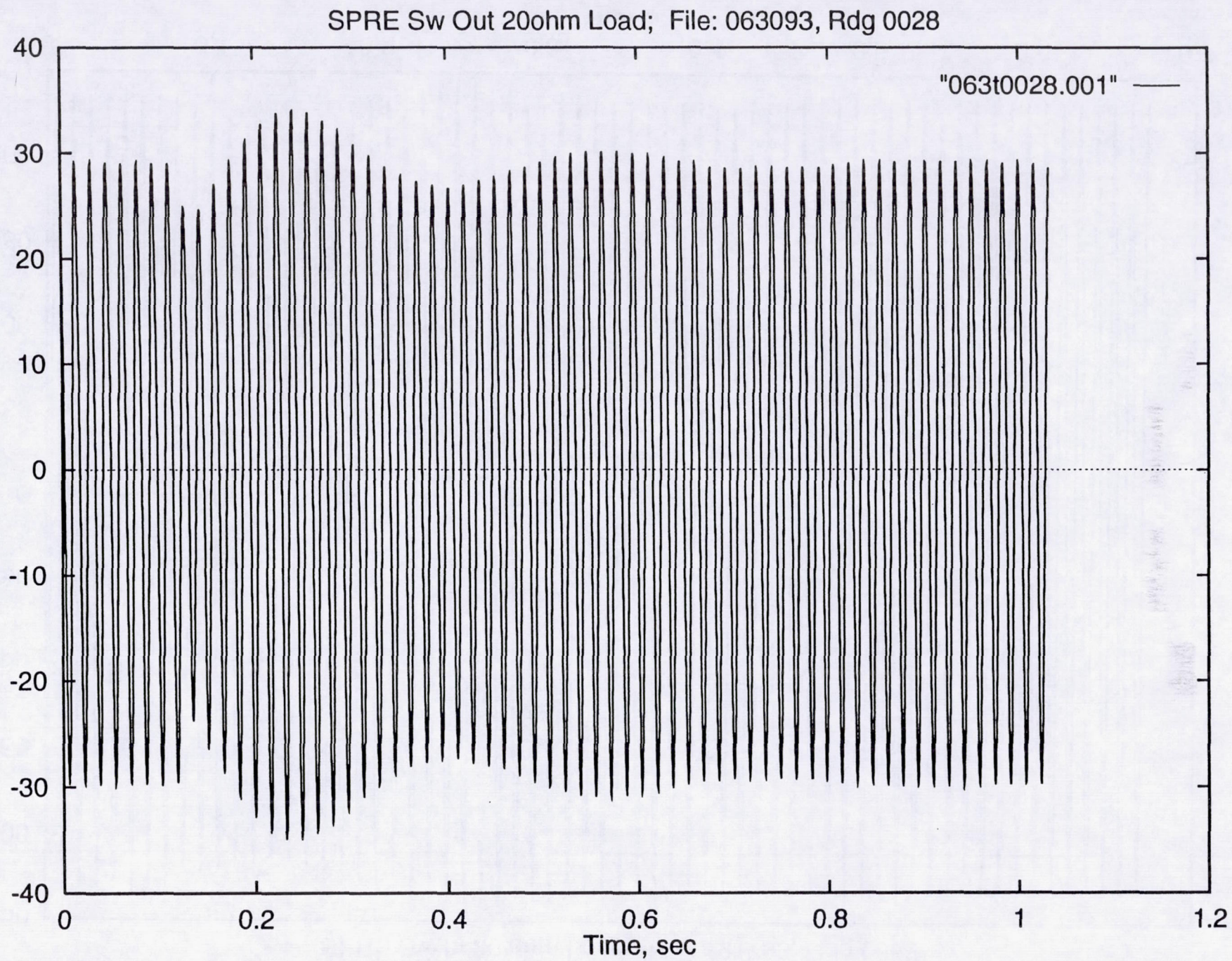
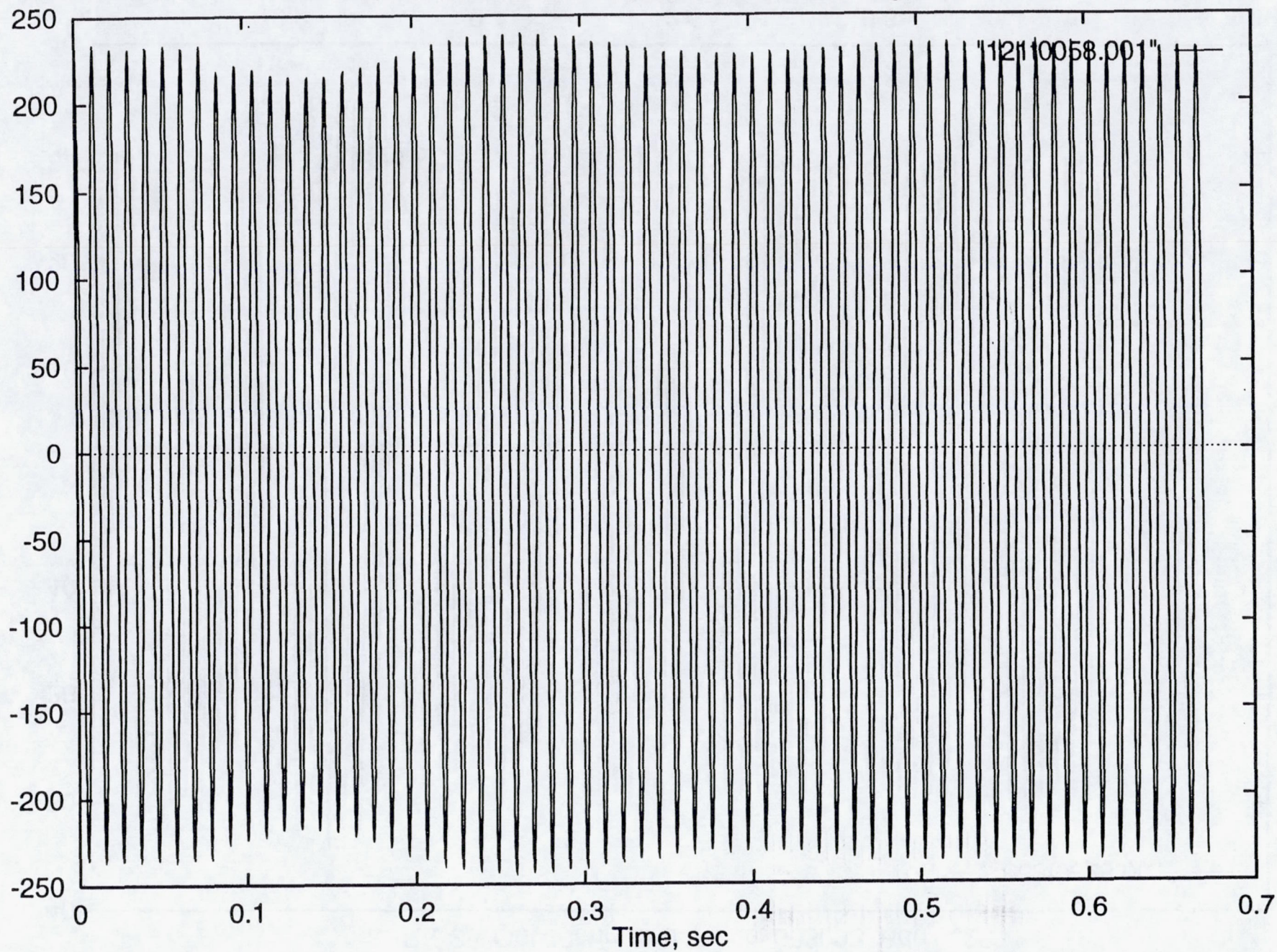


Figure 5-2b

SPRE Sw In 20.ohm Load; File: 121793, Rdg 0058

88

Load Voltage



Aux Load Current, Amps

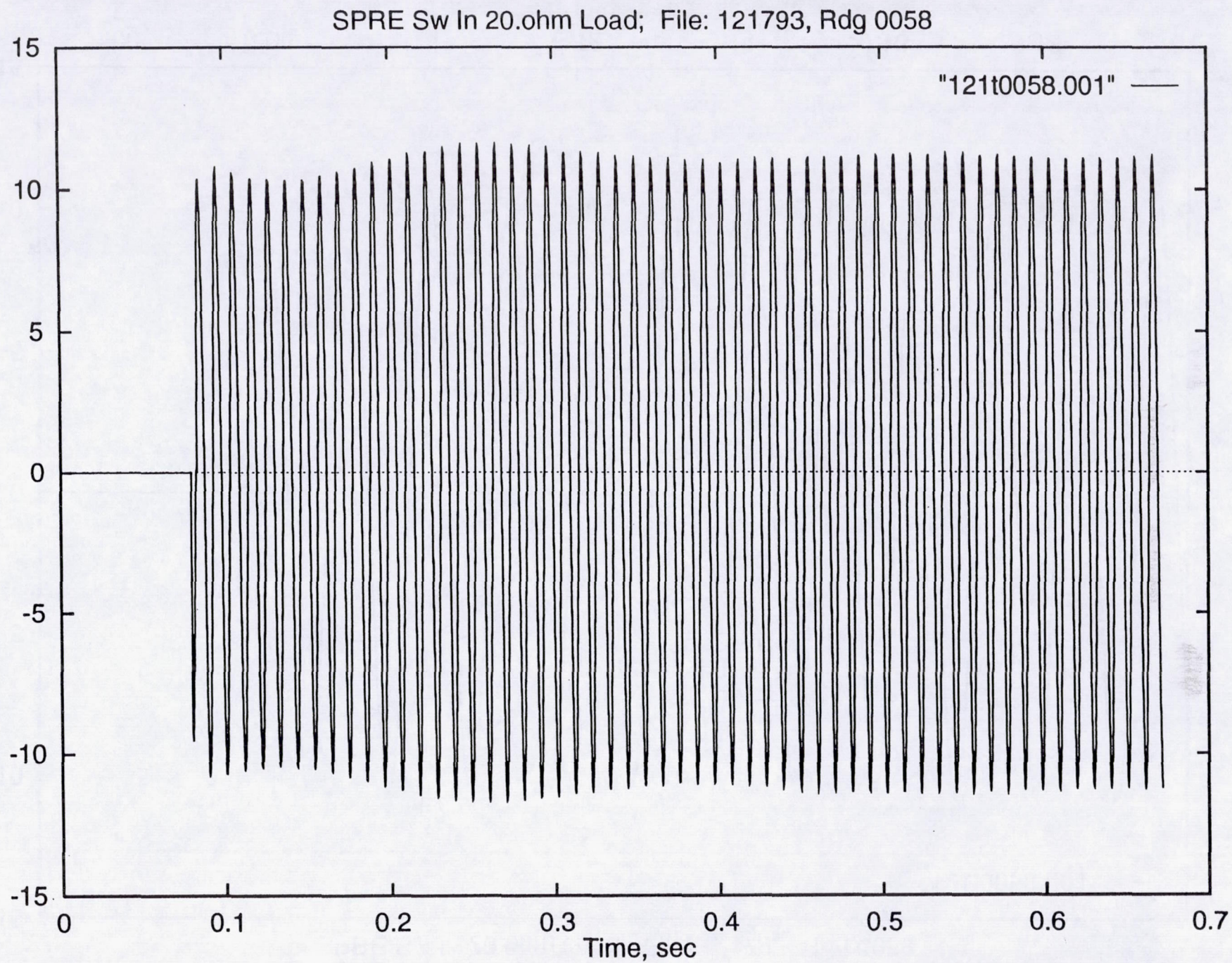
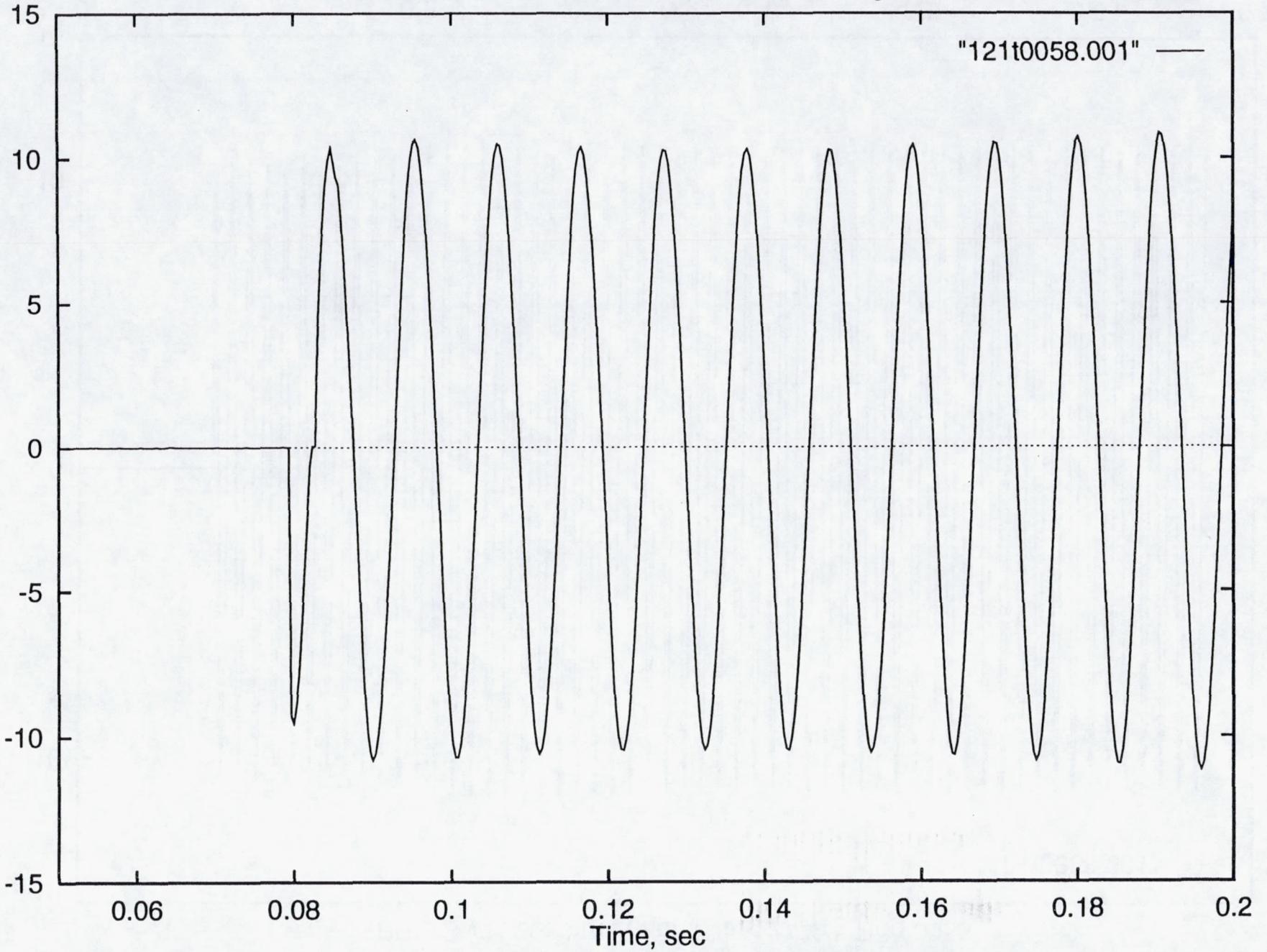


Figure 5-3b

SPRE Sw In 20.ohm Load; File: 121793, Rdg 0058



Total Current, Amps

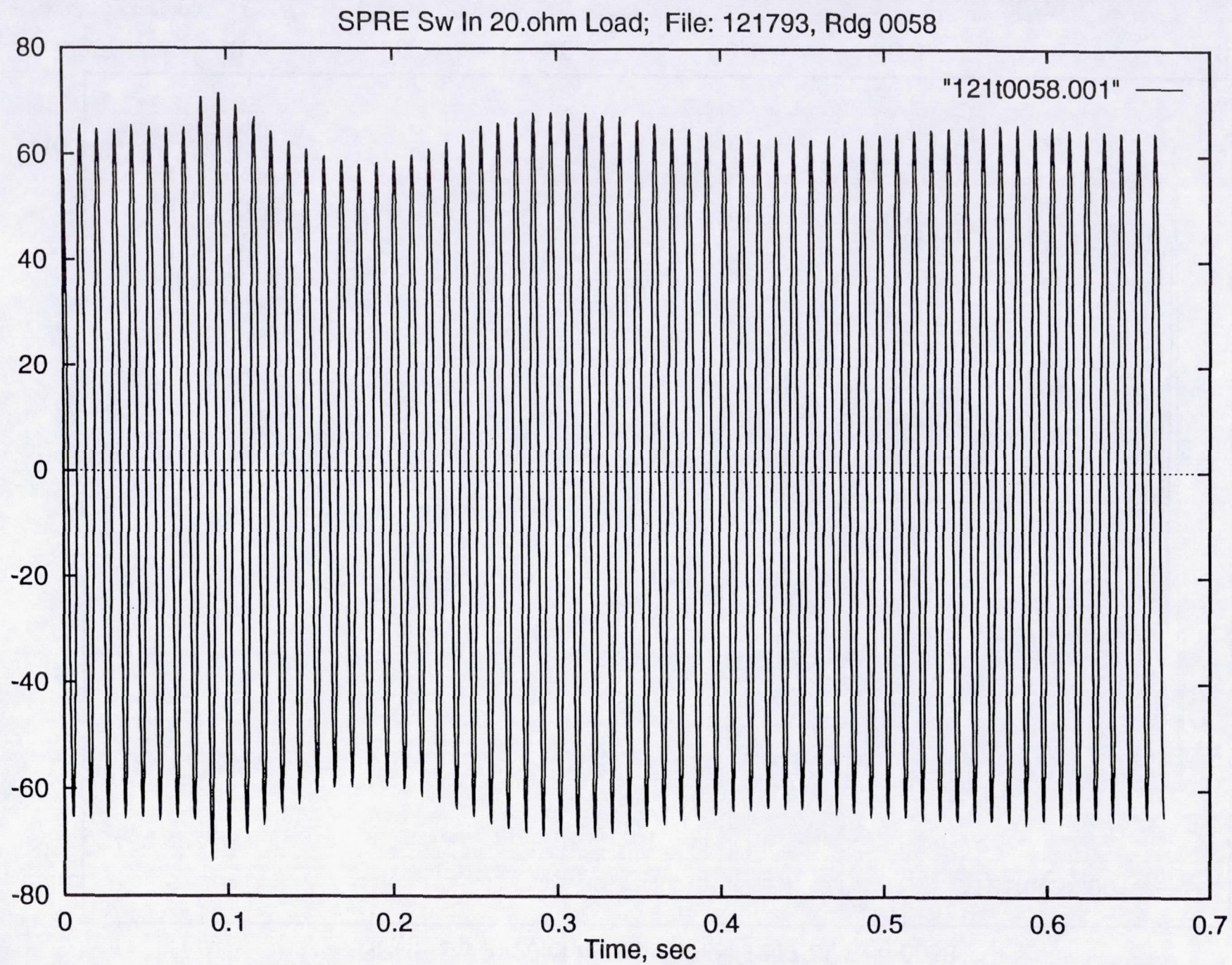
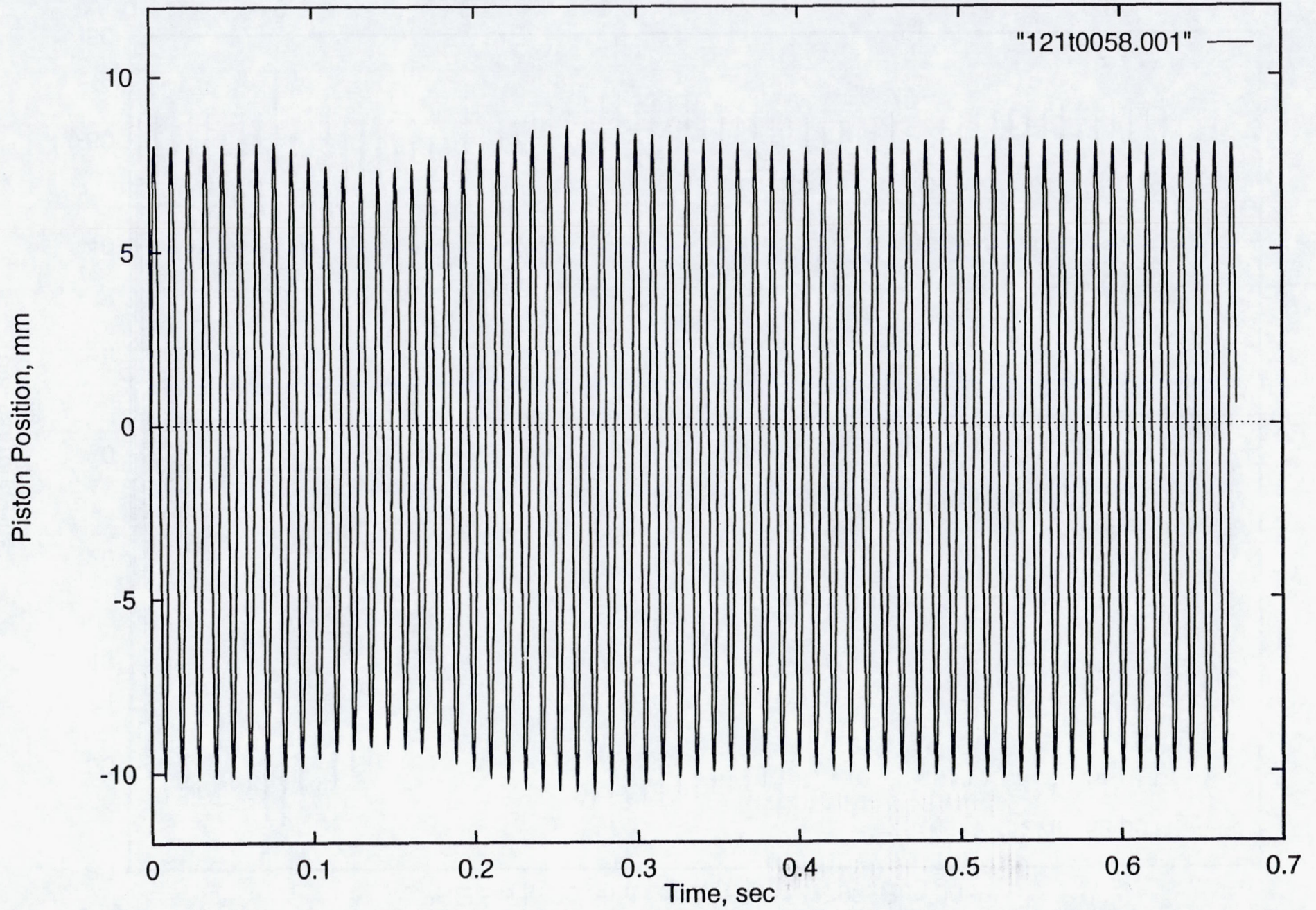


Figure 5-3d

SPRE Sw In 20.ohm Load; File: 121793, Rdg 0058



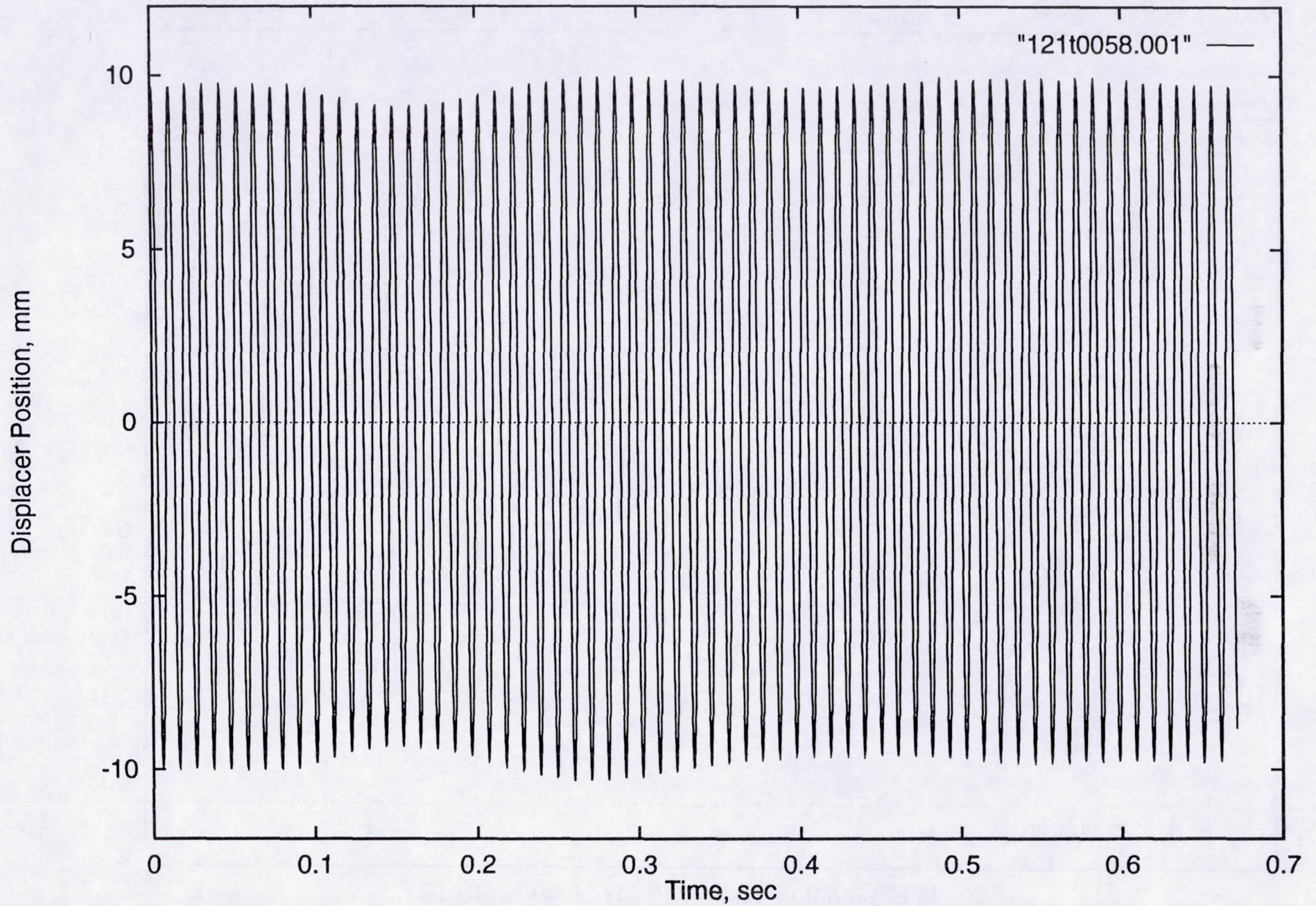
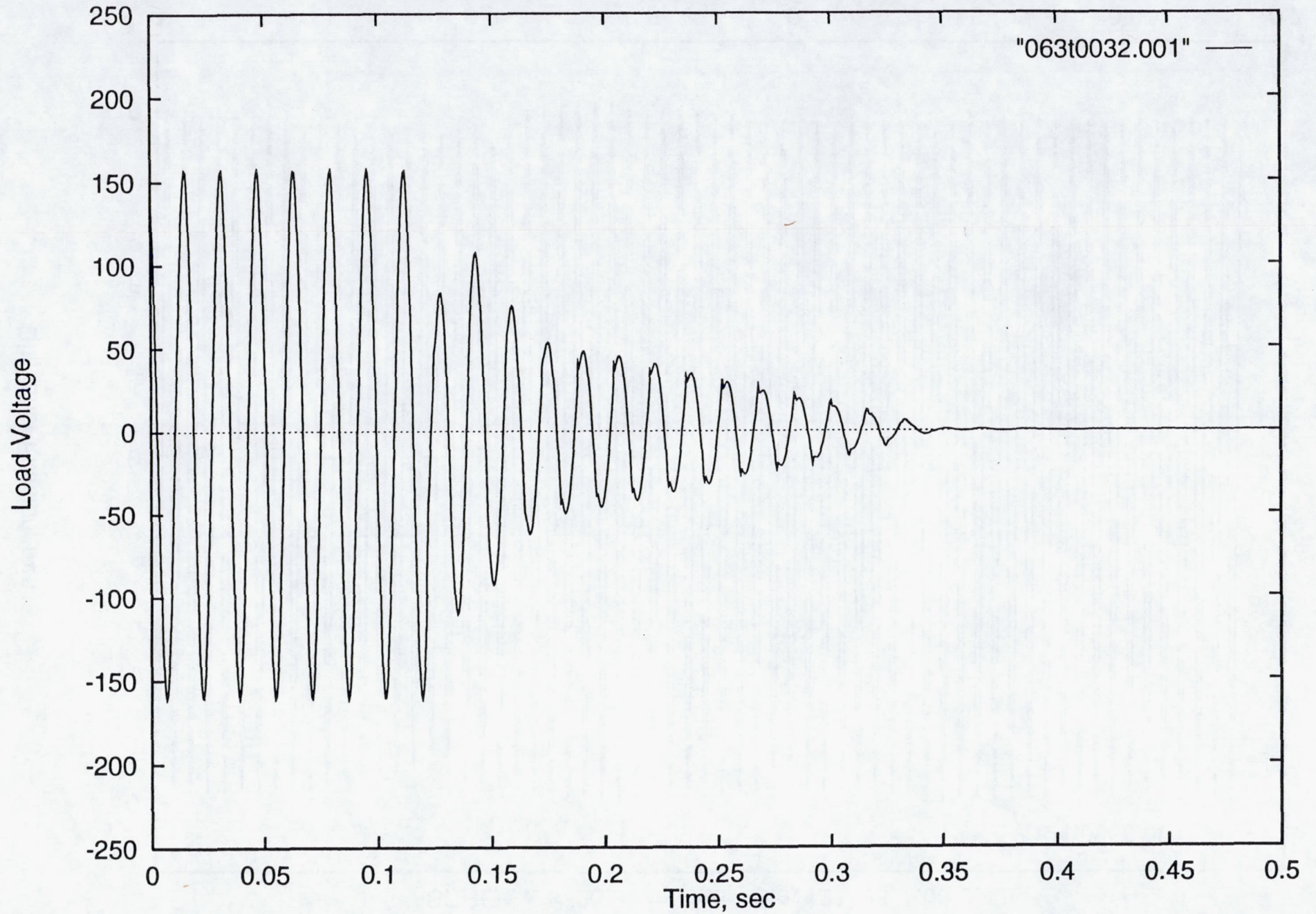


Figure 5-3f

SPRE Start 1/3 HP Motor; File: 063093, Rdg 0032



Aux Load Current, Amps

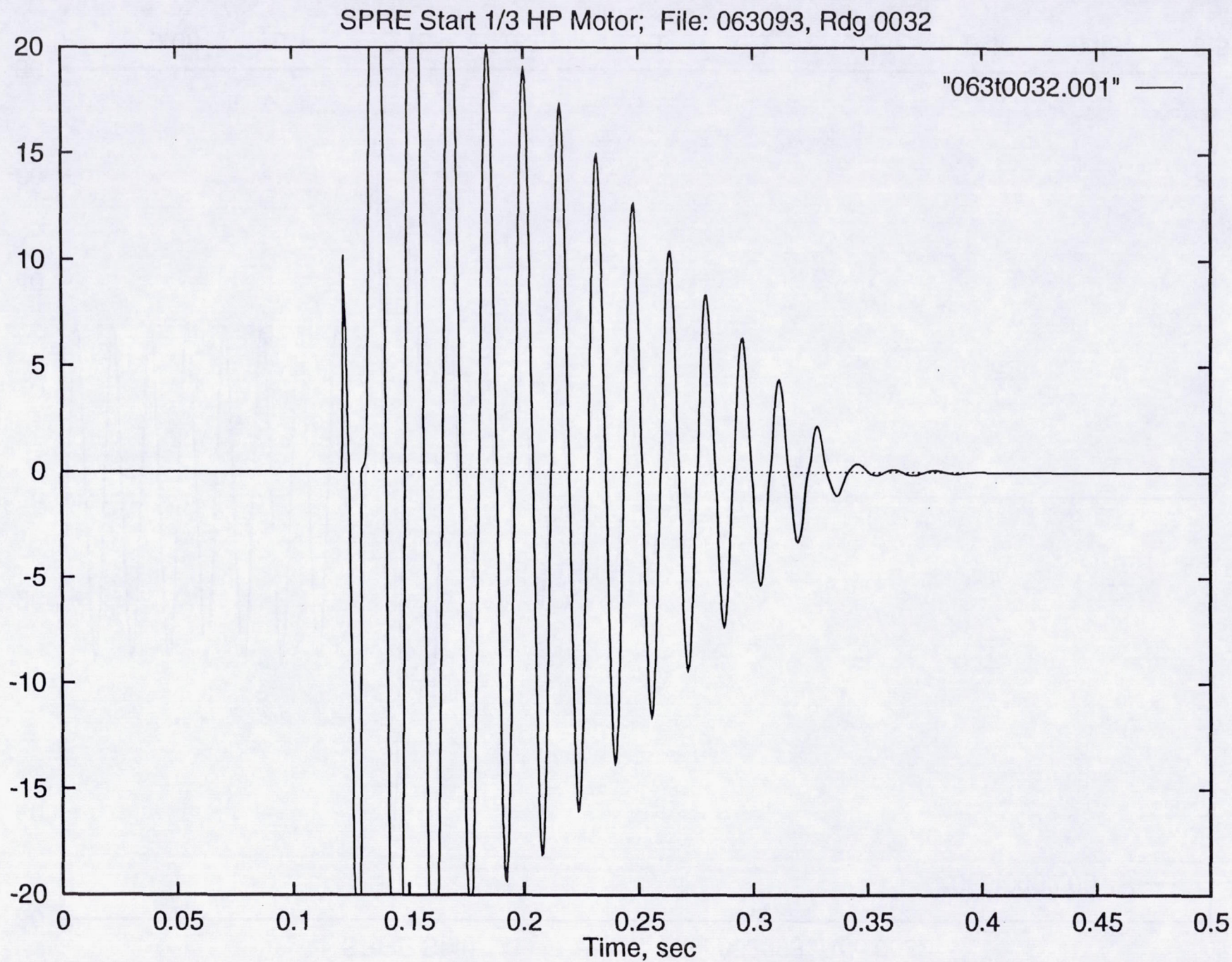
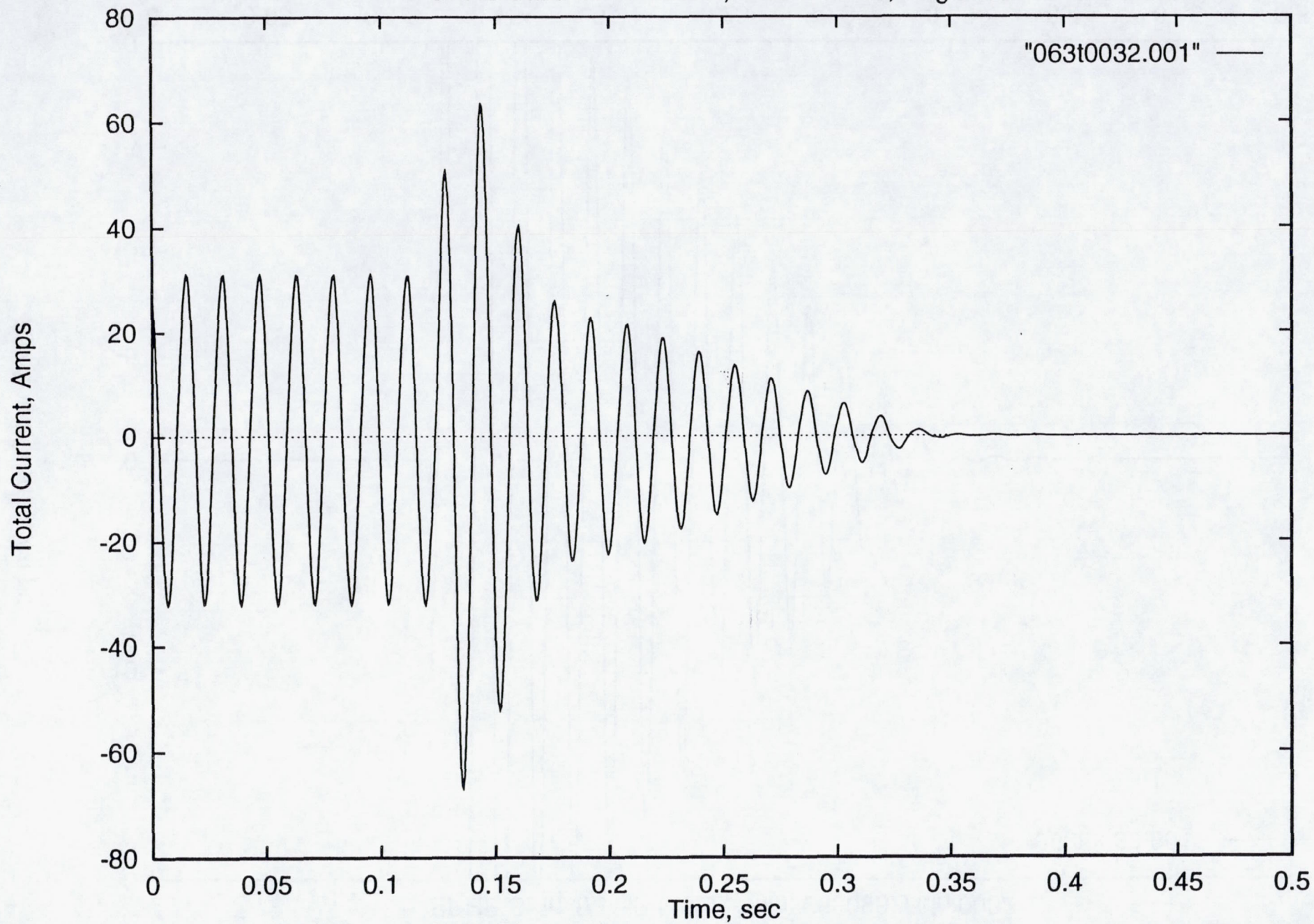


Figure 5-4b

SPRE Start 1/3 HP Motor; File: 063093, Rdg 0032



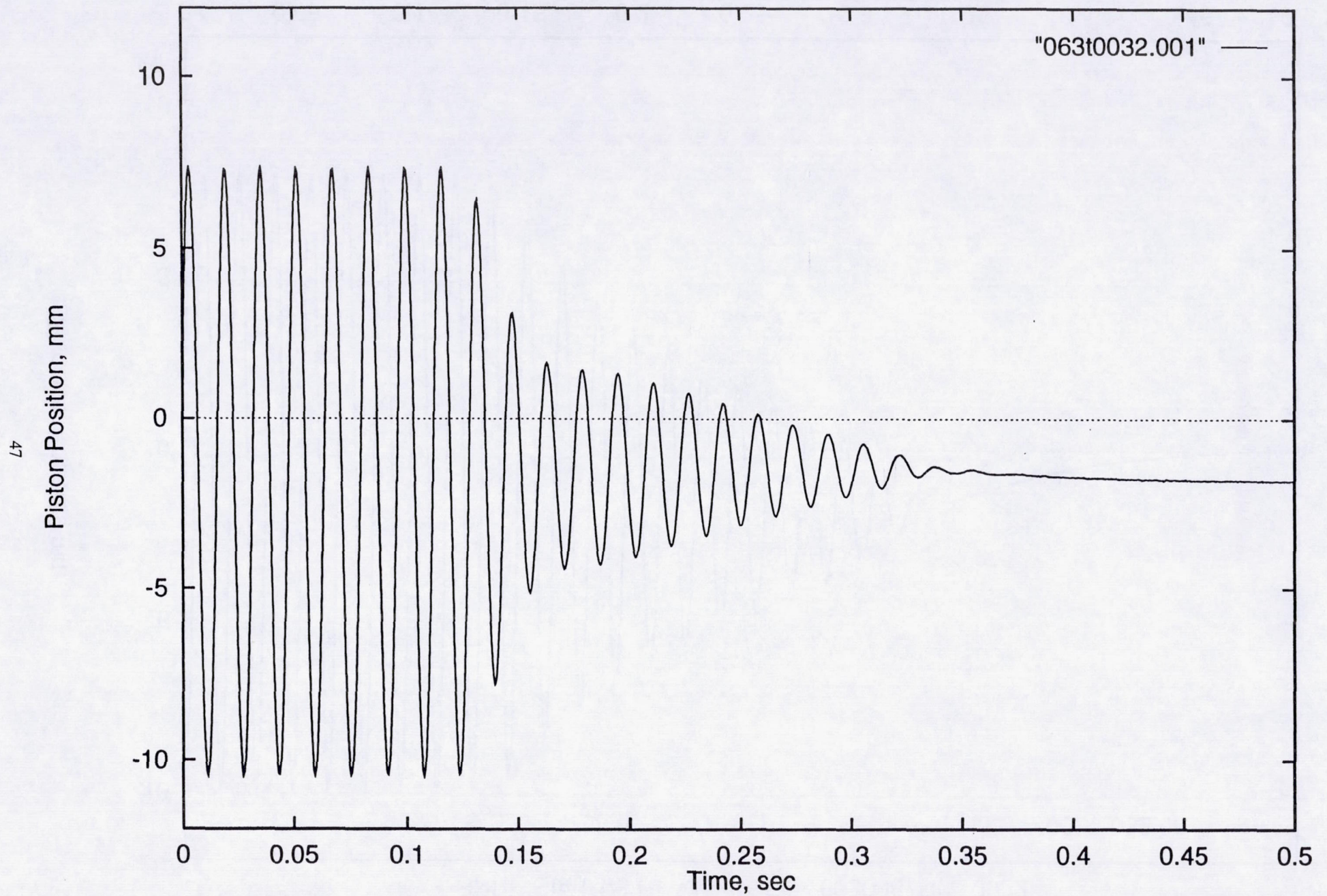
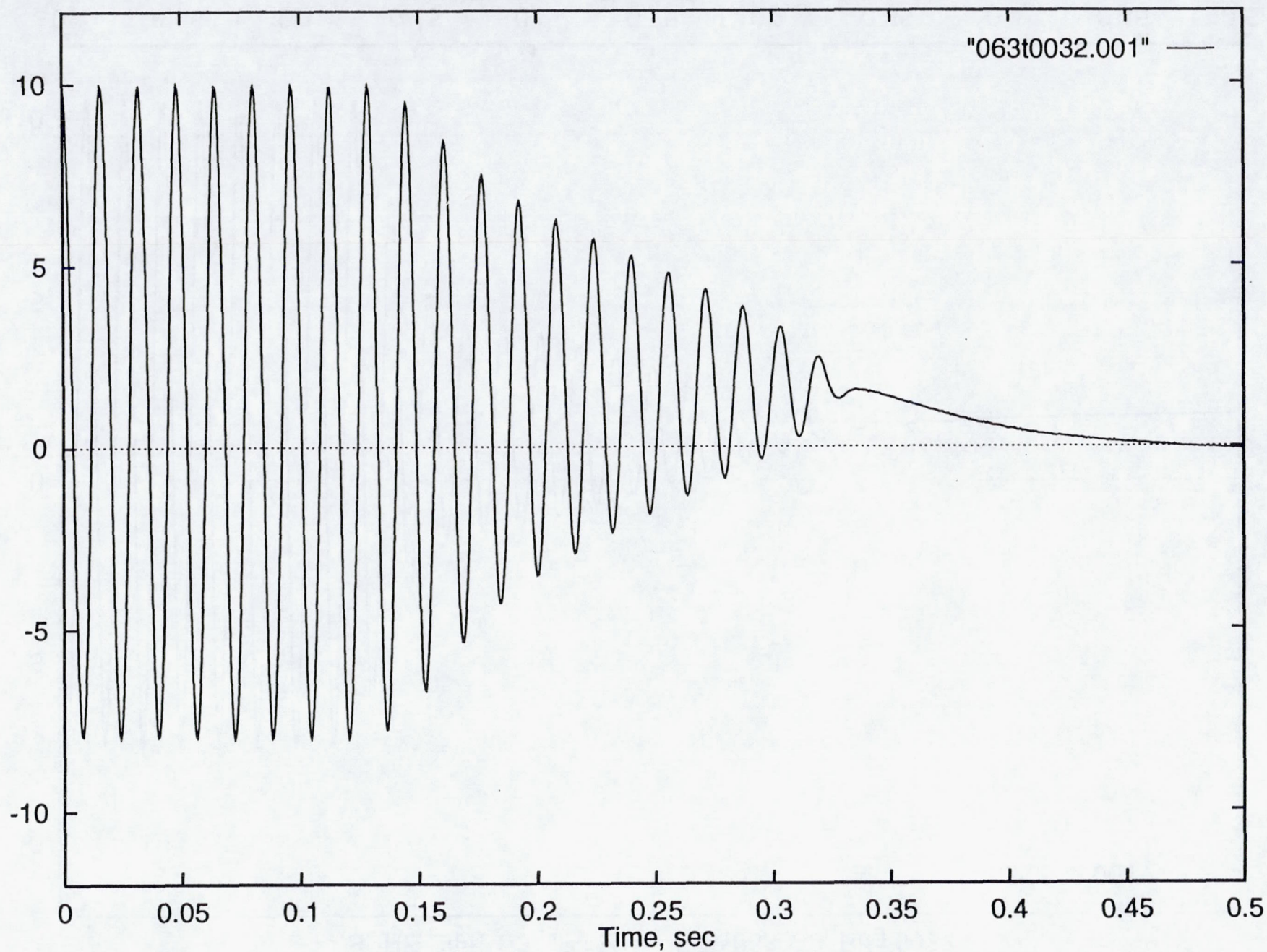


Figure 5-4d

SPRE Start 1/3 HP Motor; File: 063093, Rdg 0032

Displacer Position, mm

"063t0032.001" —



49
Load Voltage

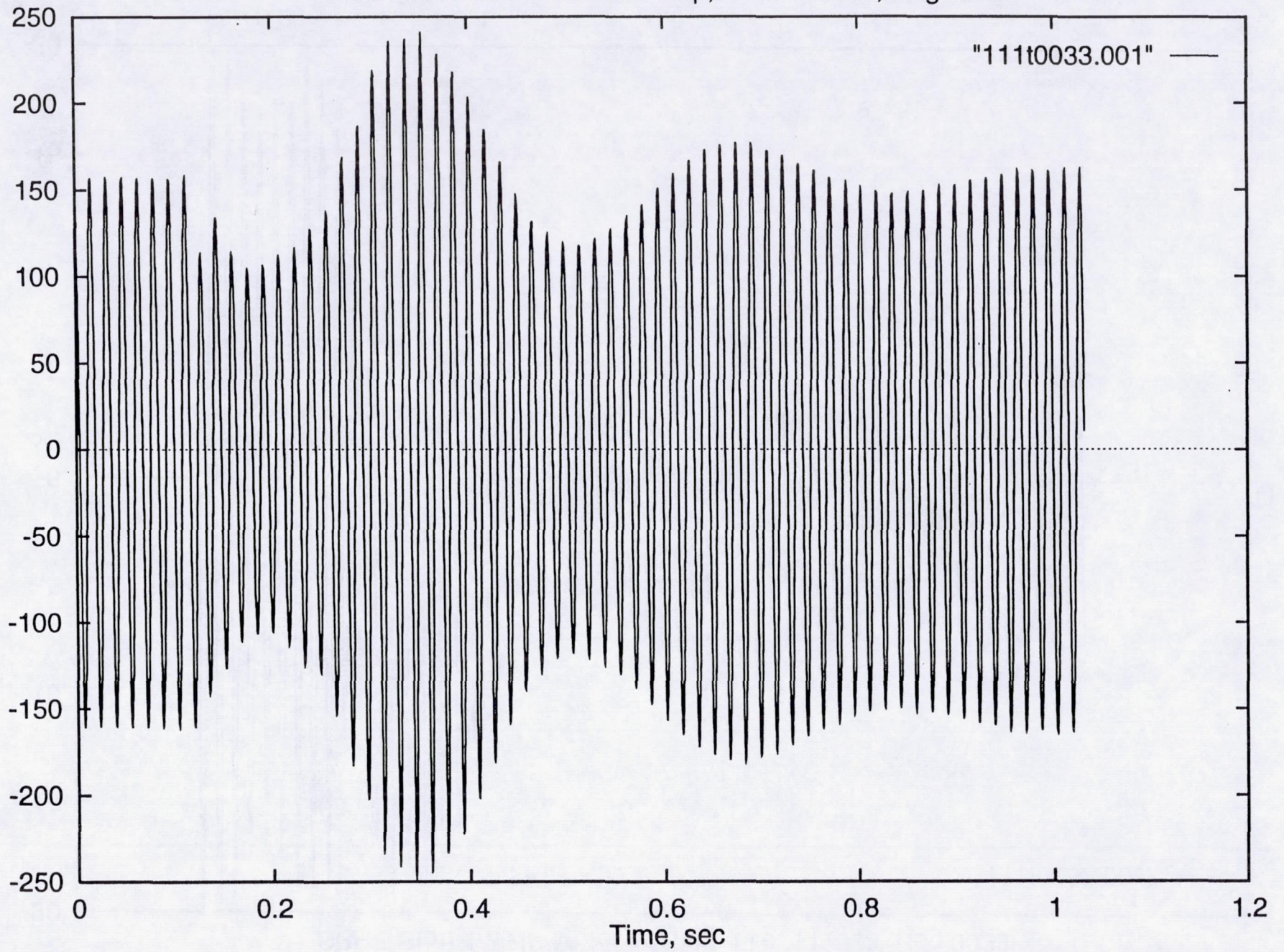
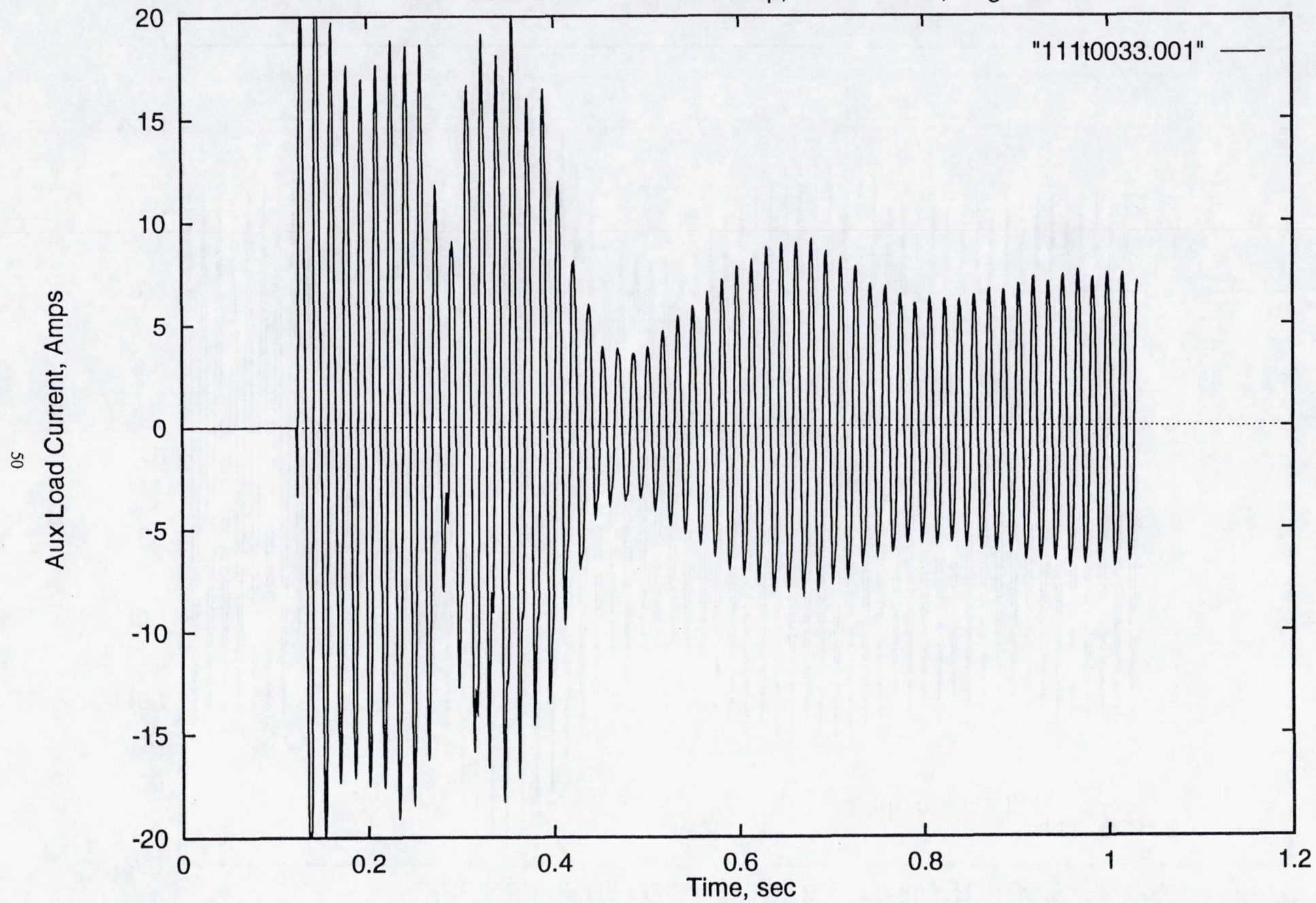


Figure 5-5a

SPRE Start 1/3 HP Motor w/ Cap; File: 111893, Rdg 0033



SPRE Start 1/3 HP Motor w/ Cap; File: 111893, Rdg 0033

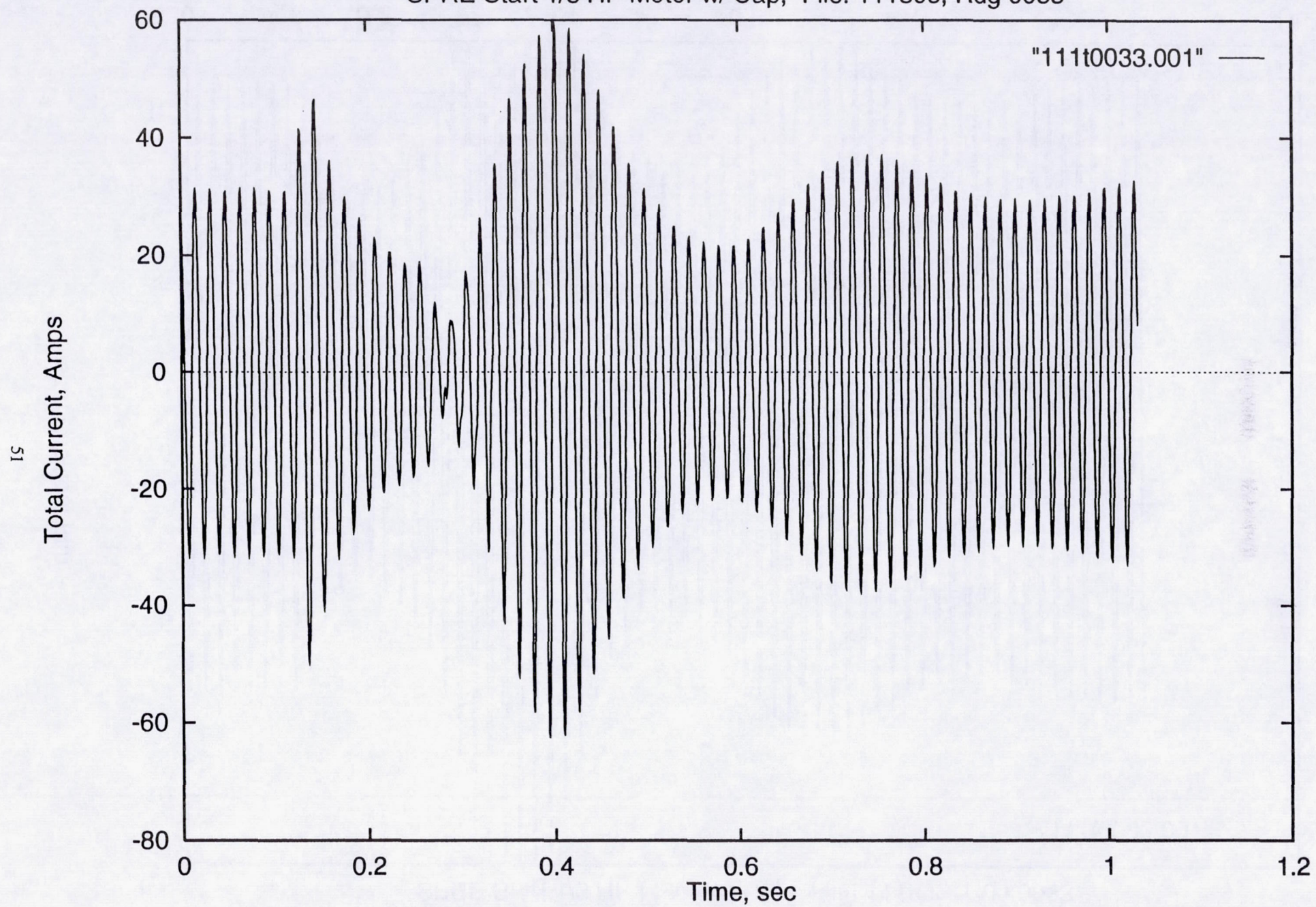
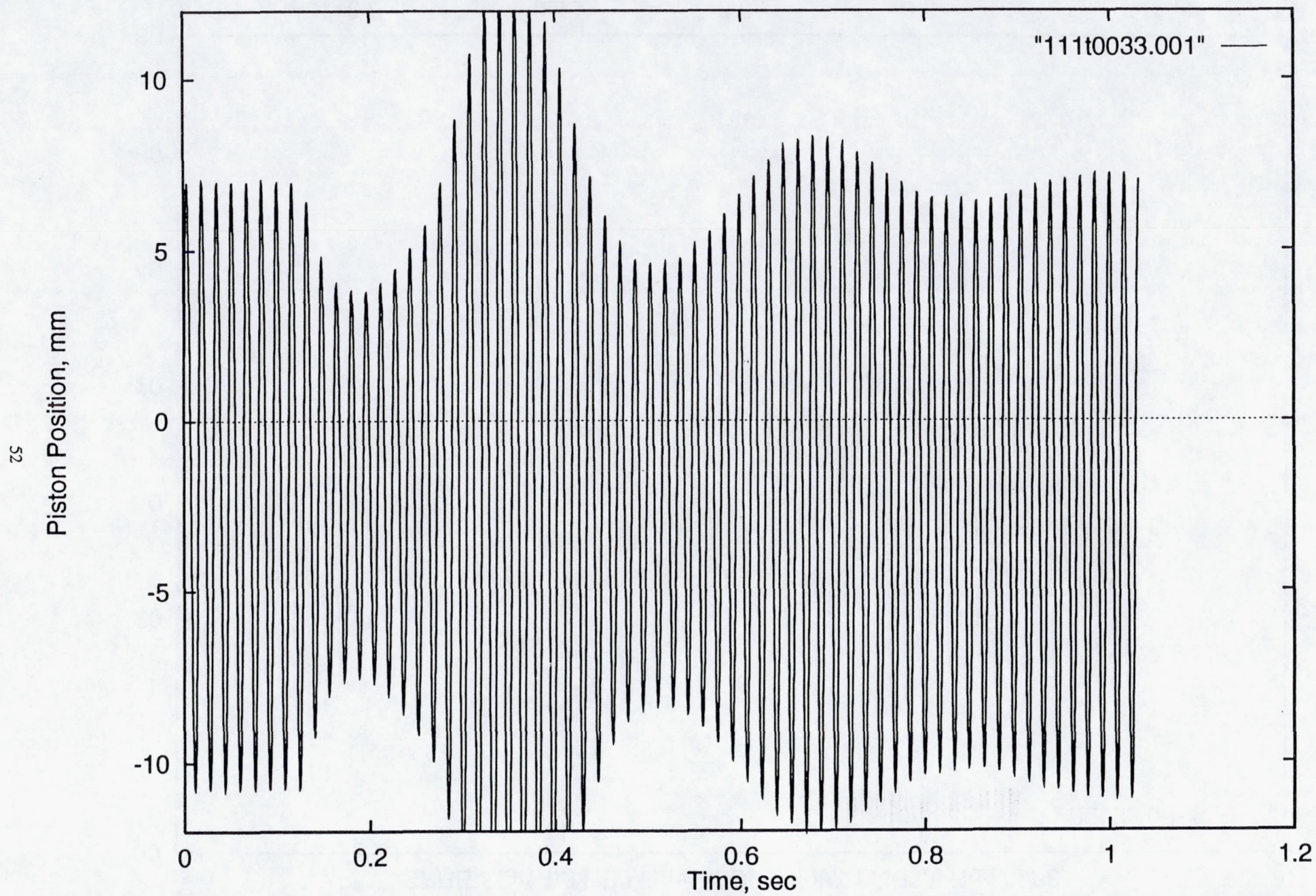


Figure 5-5c

SPRE Start 1/3 HP Motor w/ Cap; File: 111893, Rdg 0033



SPRE Start 1/3 HP Motor w/ Cap; File: 111893, Rdg 0033

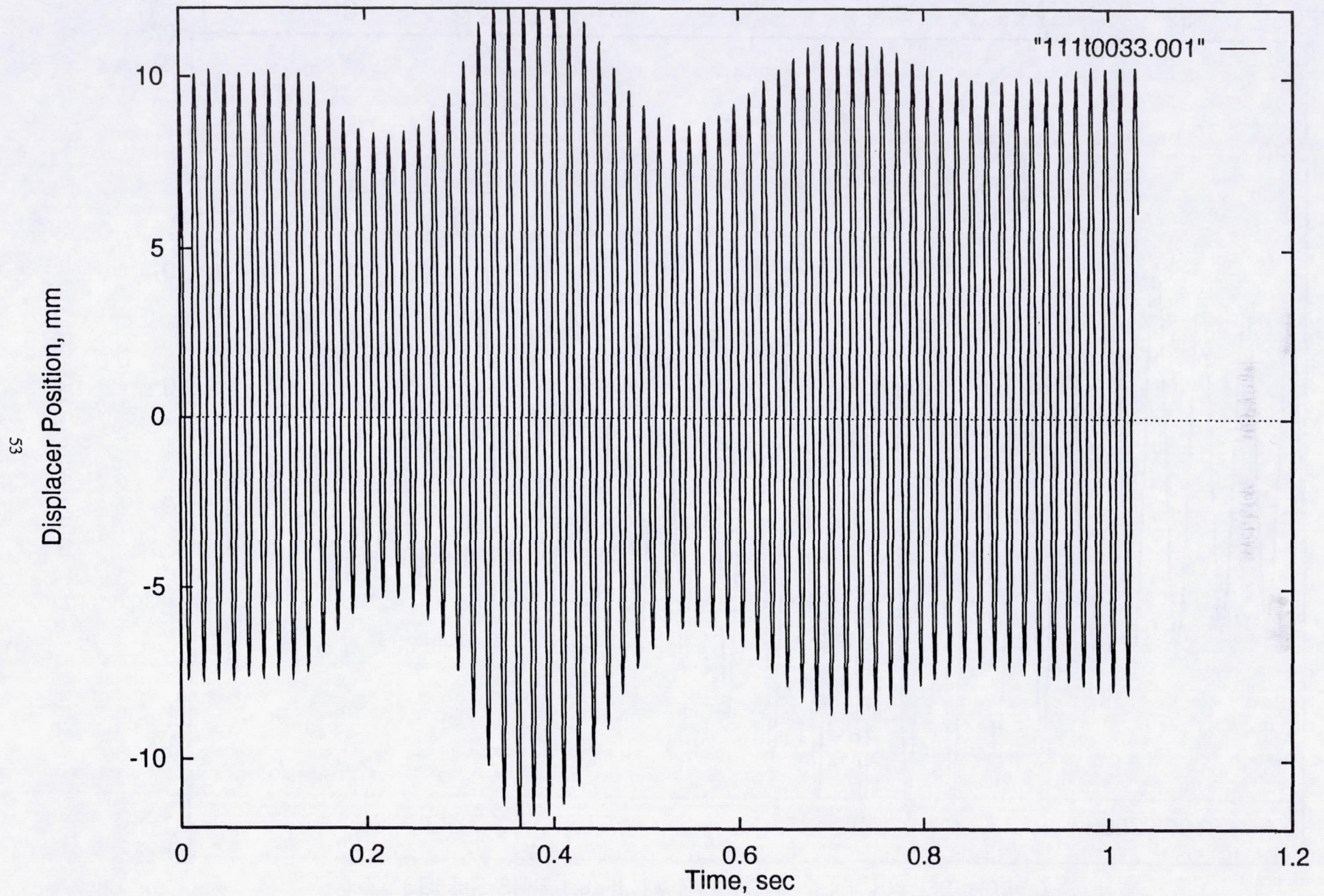
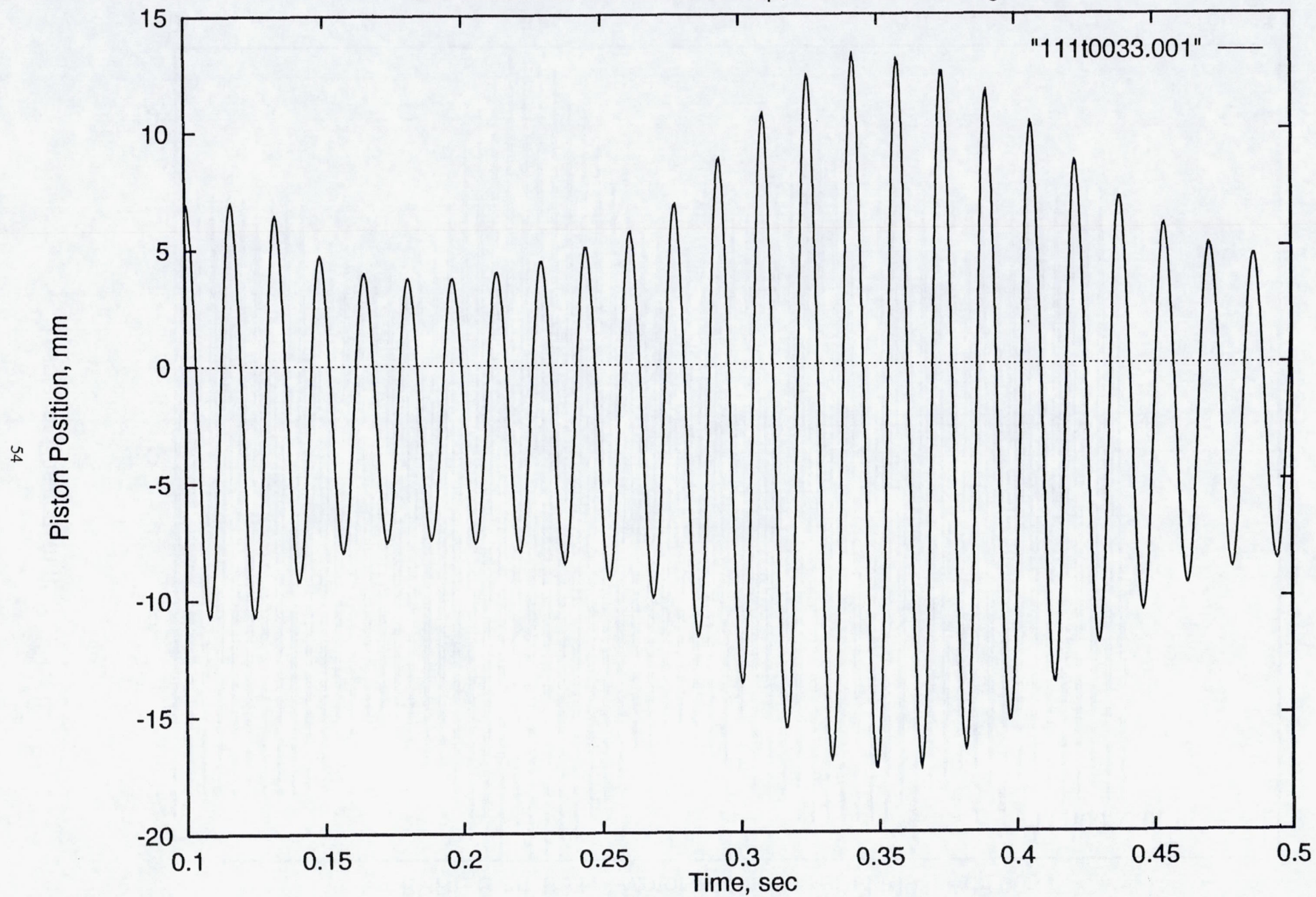


Figure 5-5e

SPRE Start 1/3 HP Motor w/ Cap; File: 111893, Rdg 0033



SPRE Start 1/3 HP Motor w/ Cap; File: 111893, Rdg 0033

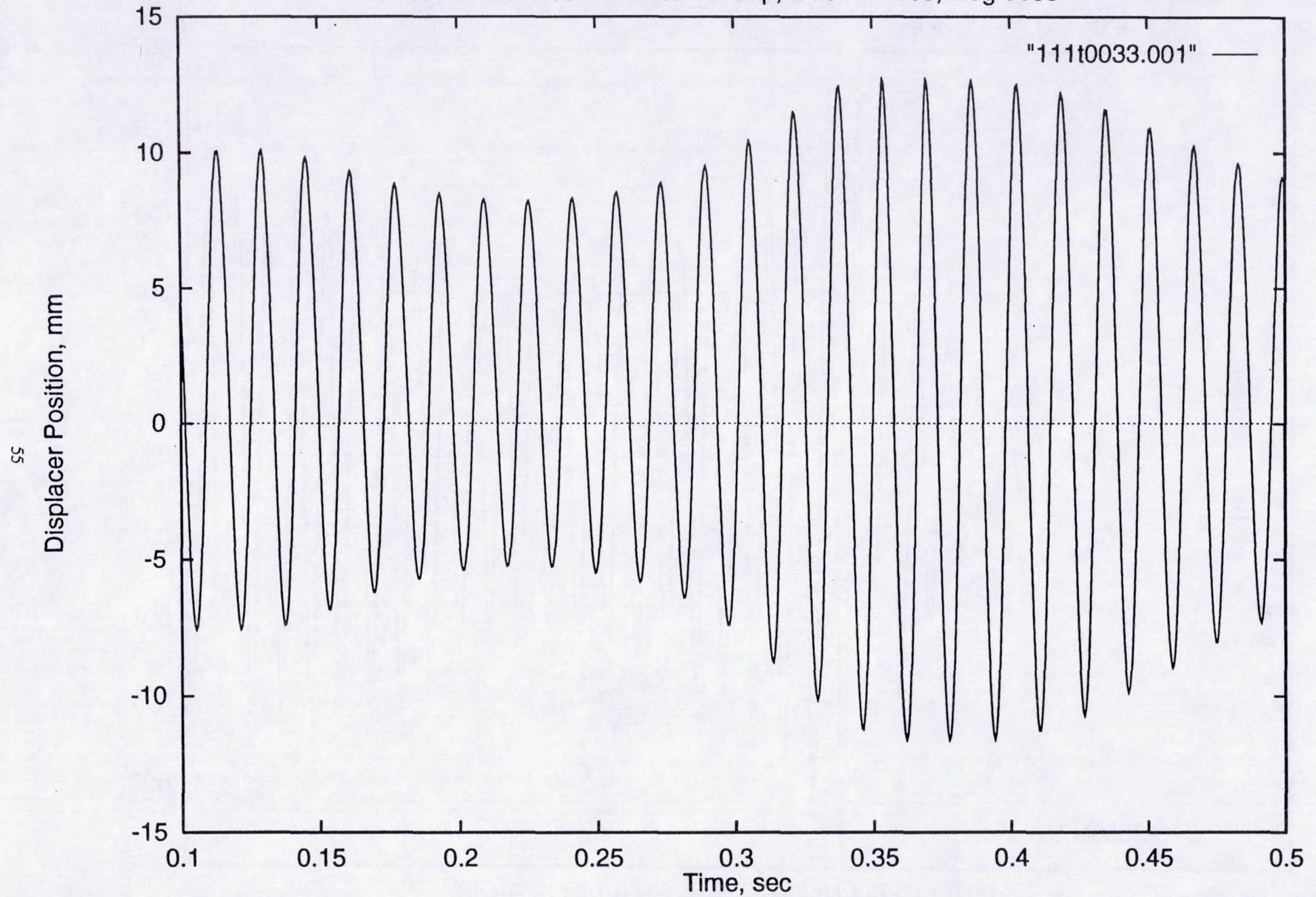
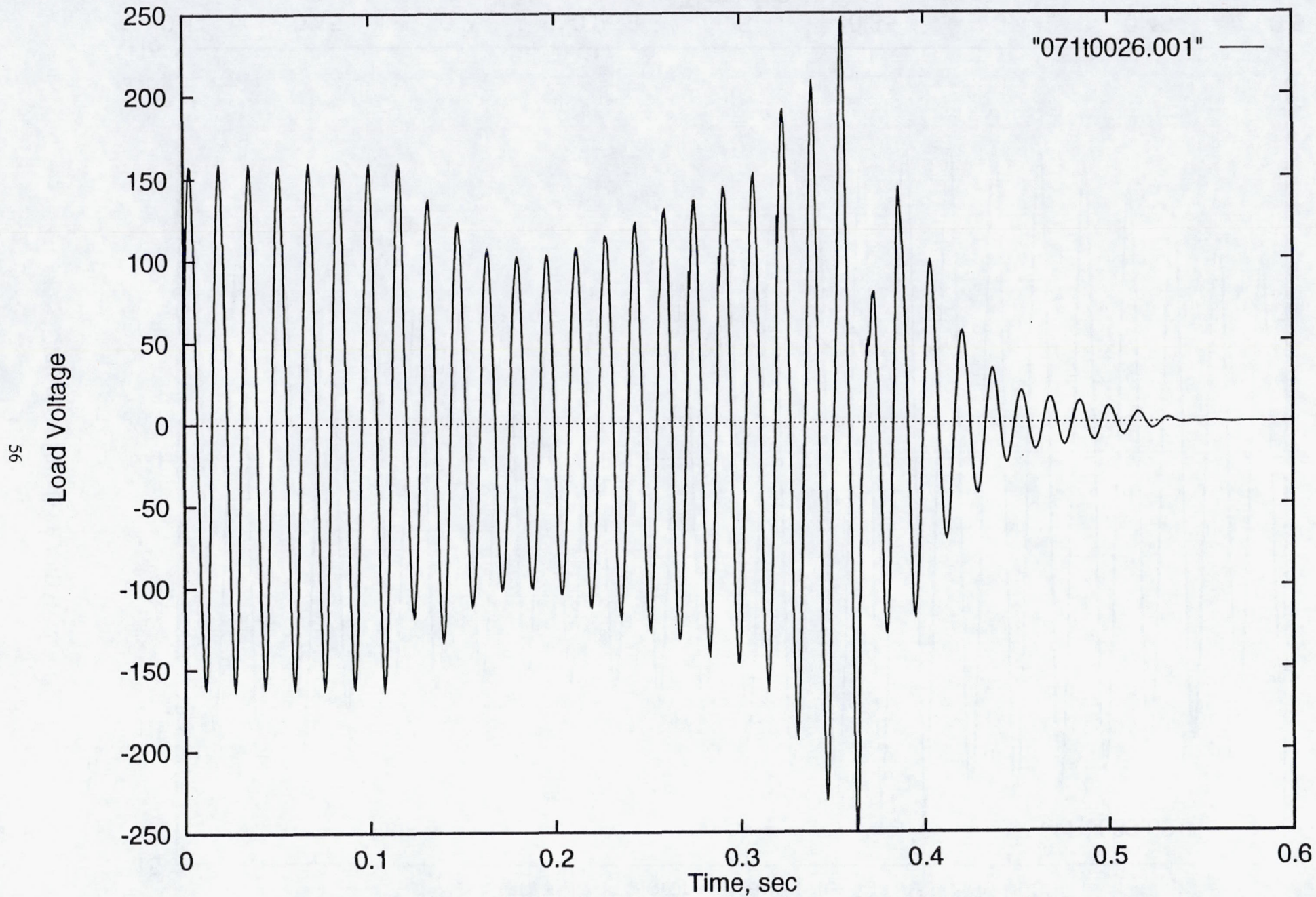


Figure 5-5g

SPRE Start 1/6 HP Motor; File: 071393, Rdg 0026



SPRE Start 1/6 HP Motor; File: 071393, Rdg 0026

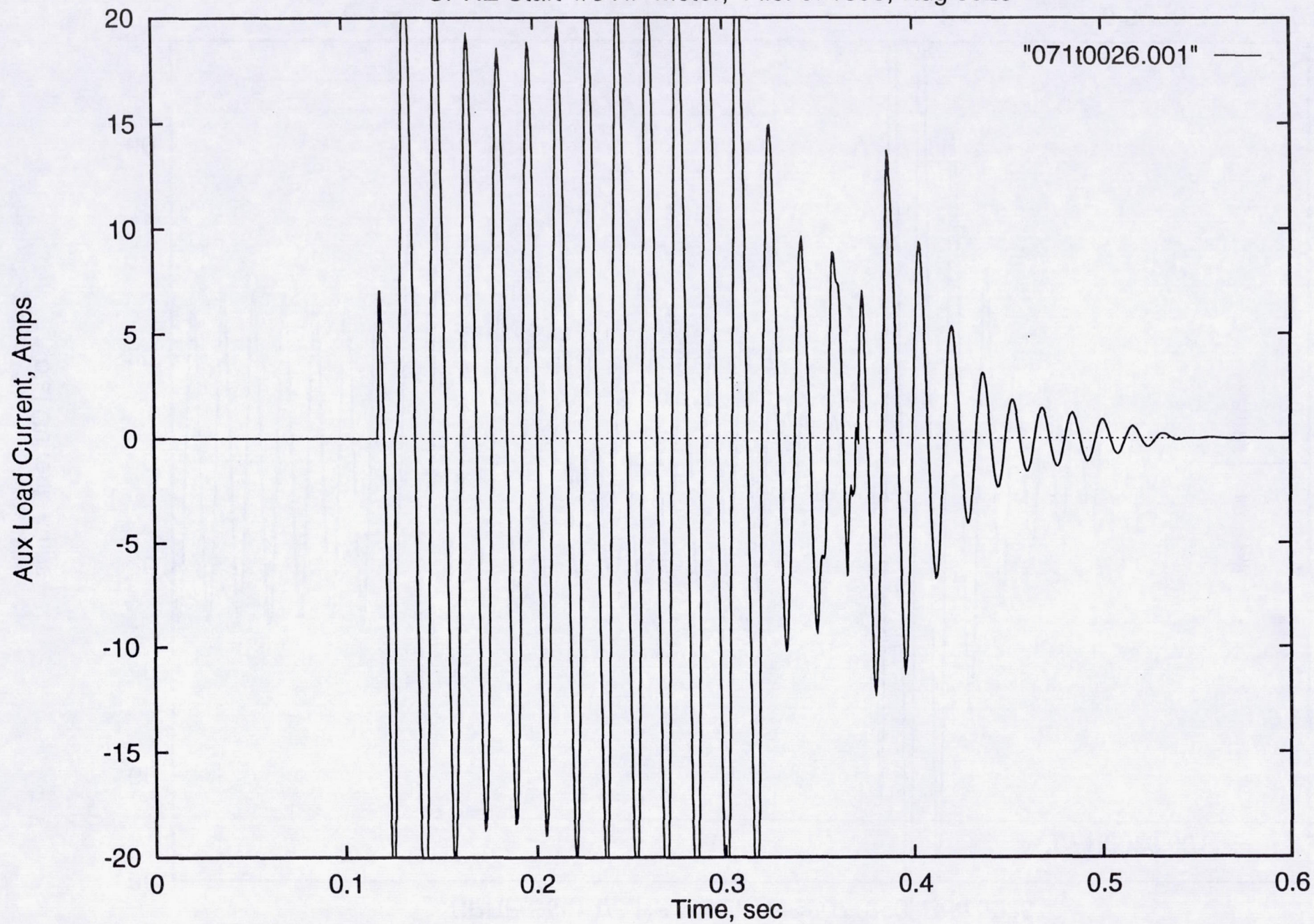
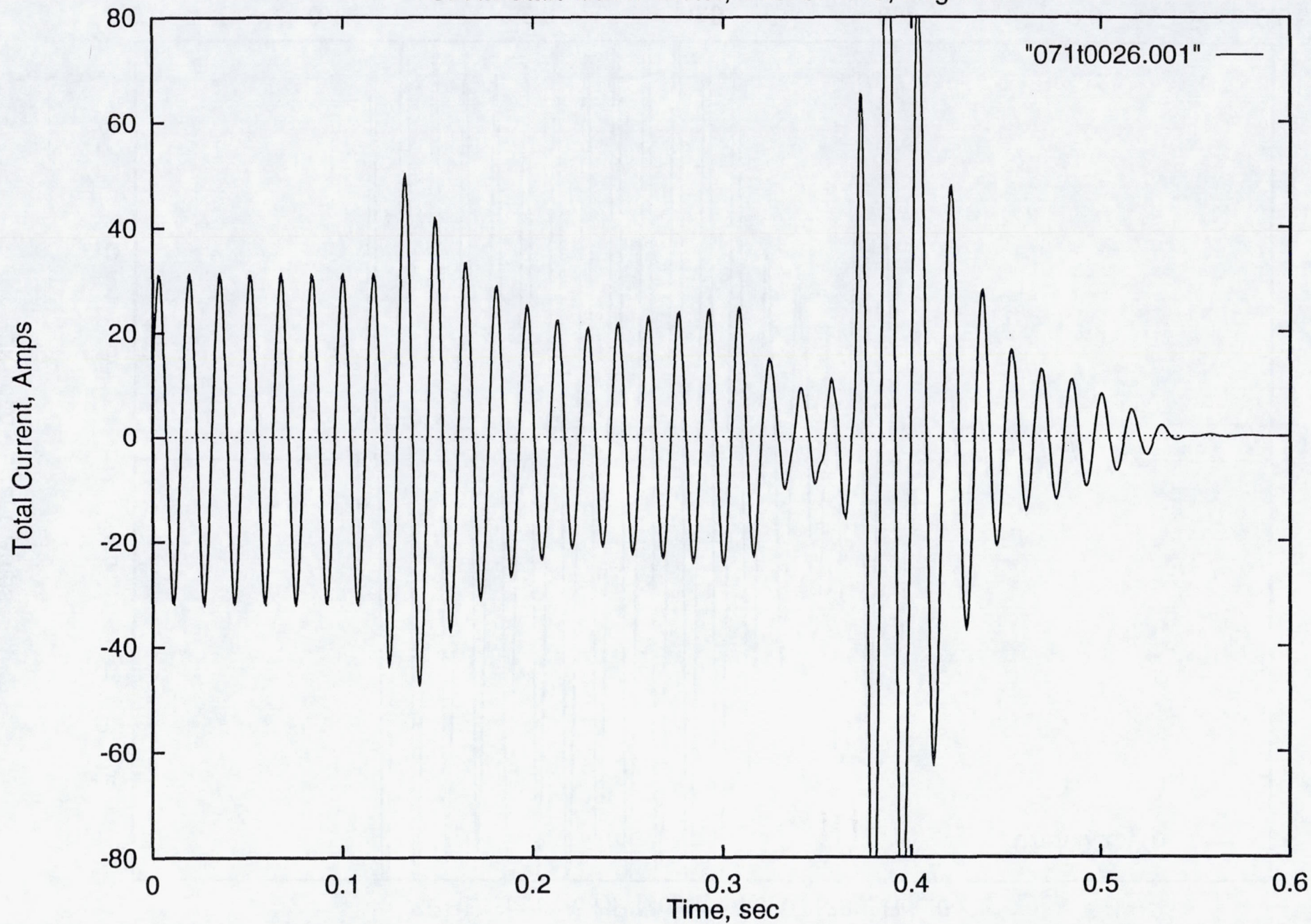


Figure 5-6b

SPRE Start 1/6 HP Motor; File: 071393, Rdg 0026



SPRE Start 1/6 HP Motor; File: 071393, Rdg 0026

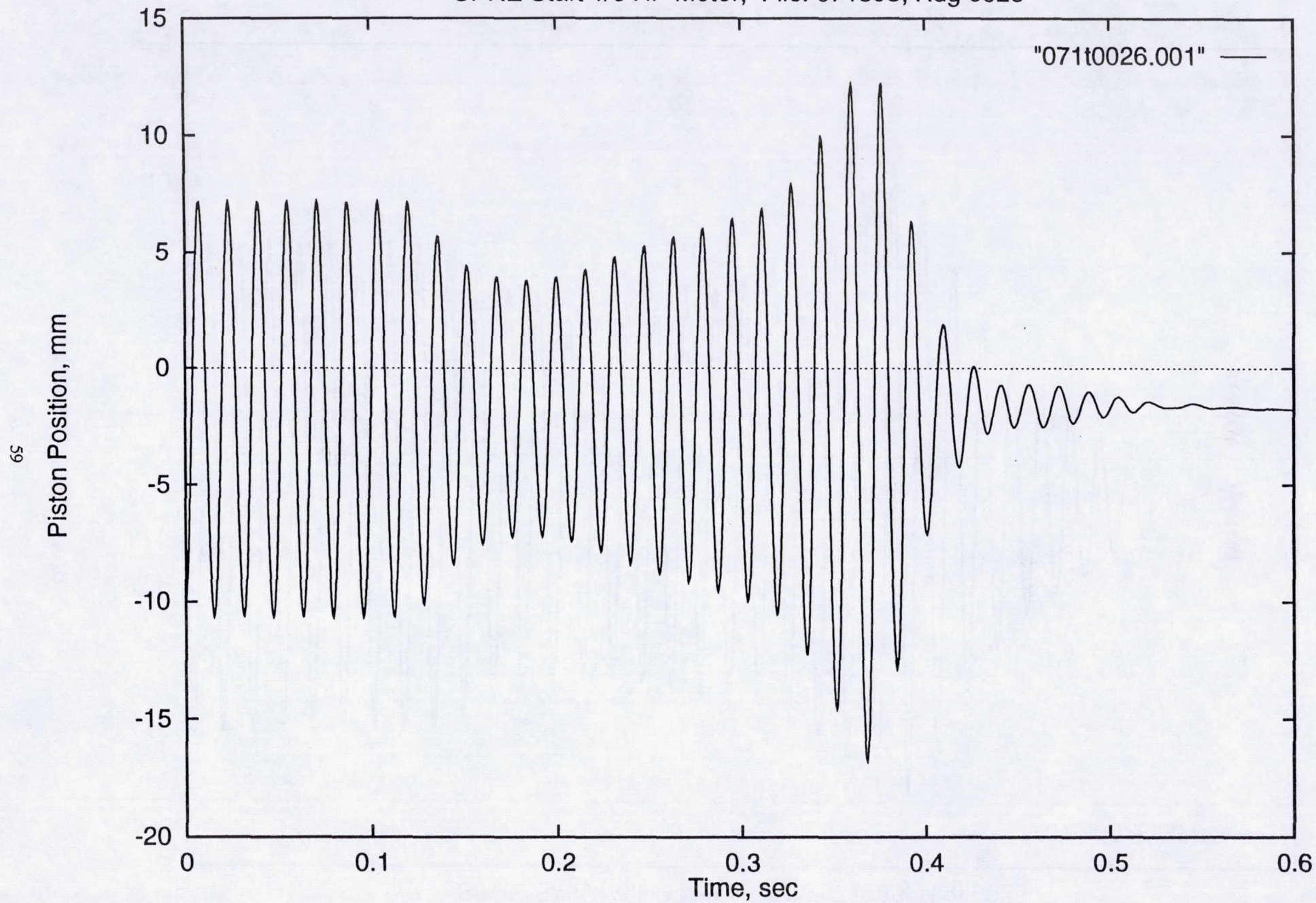
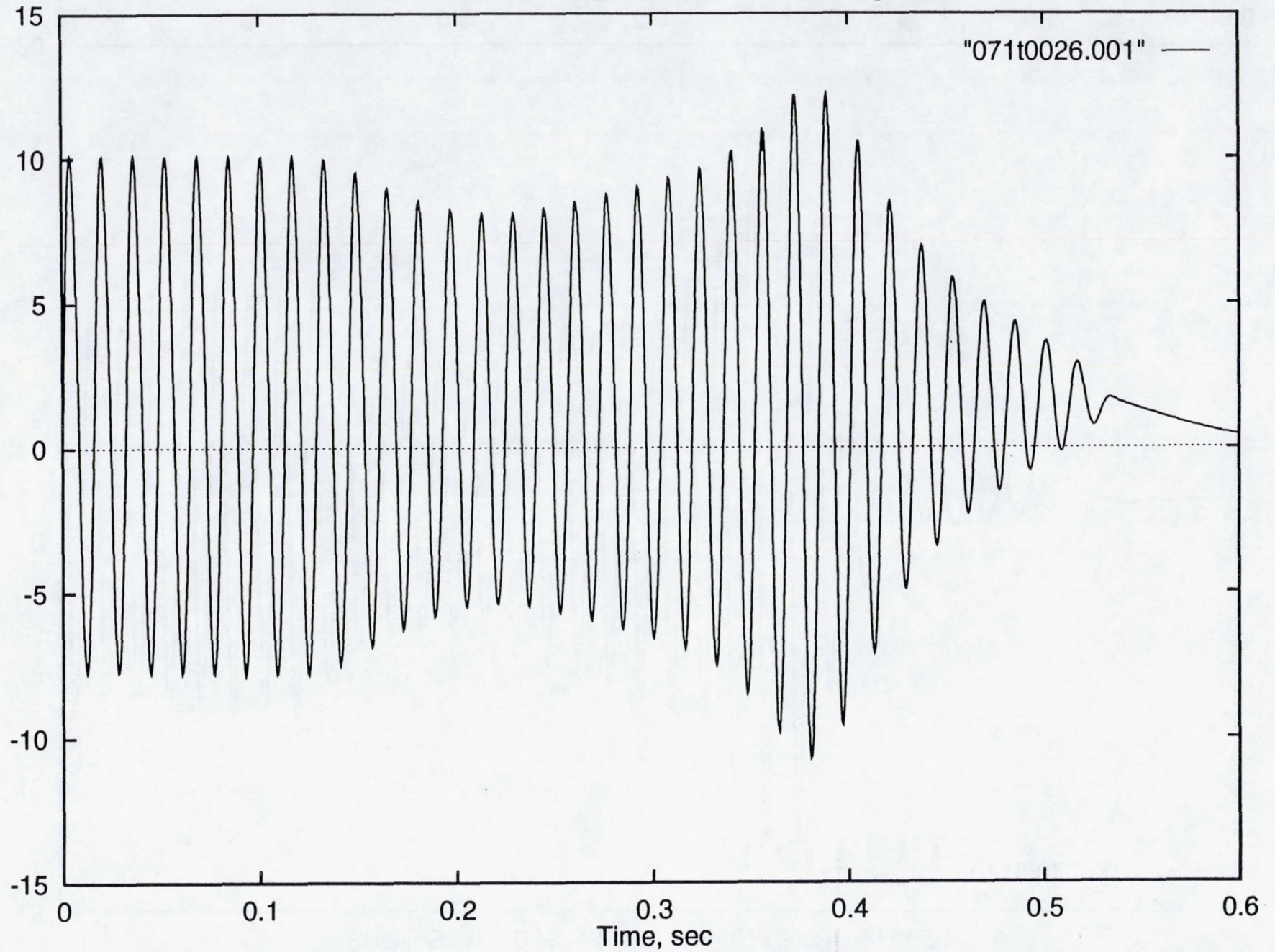


Figure 5-6d

SPRE Start 1/6 HP Motor; File: 071393, Rdg 0026

09
Displacer Position, mm



Load Voltage

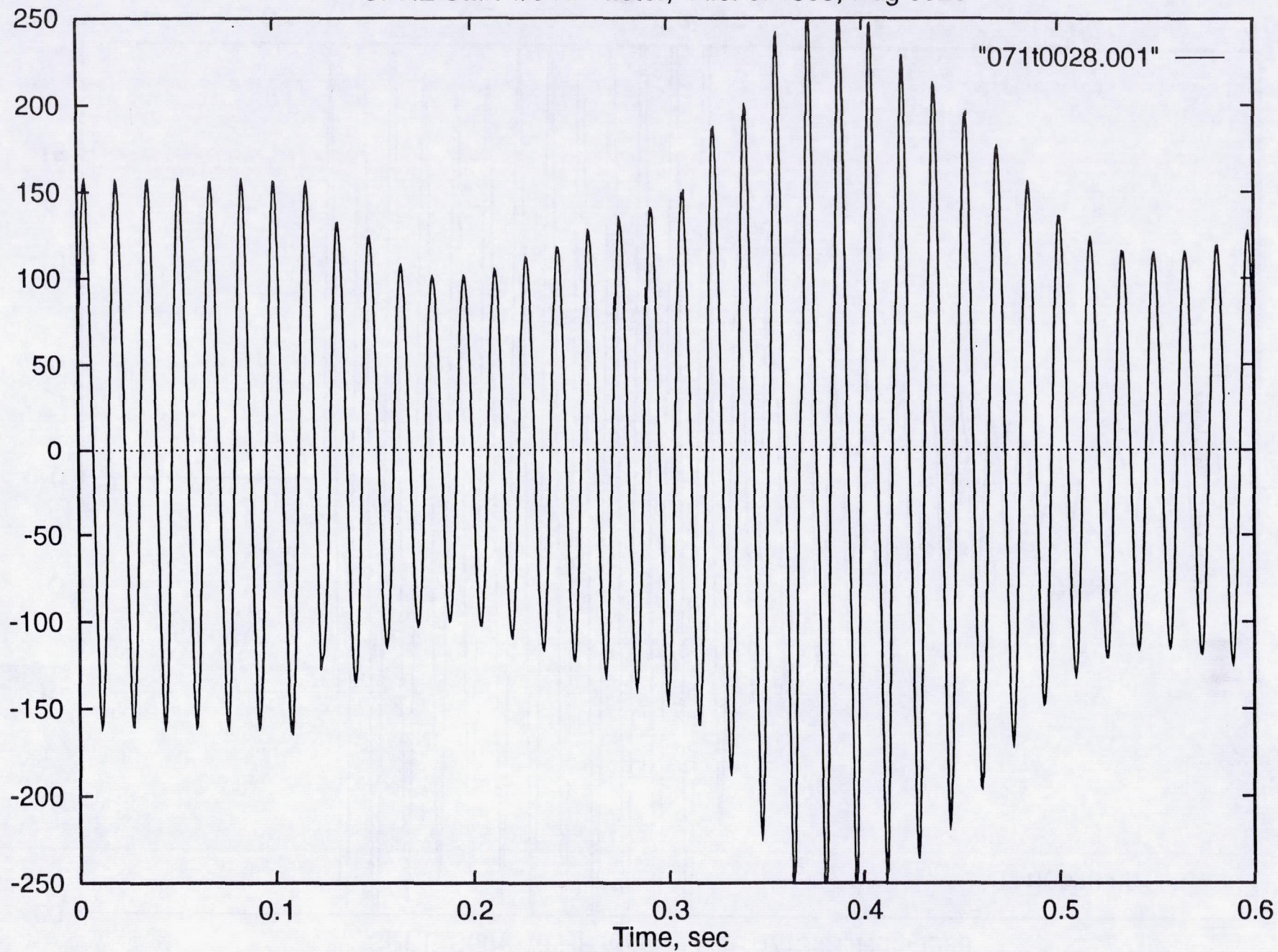
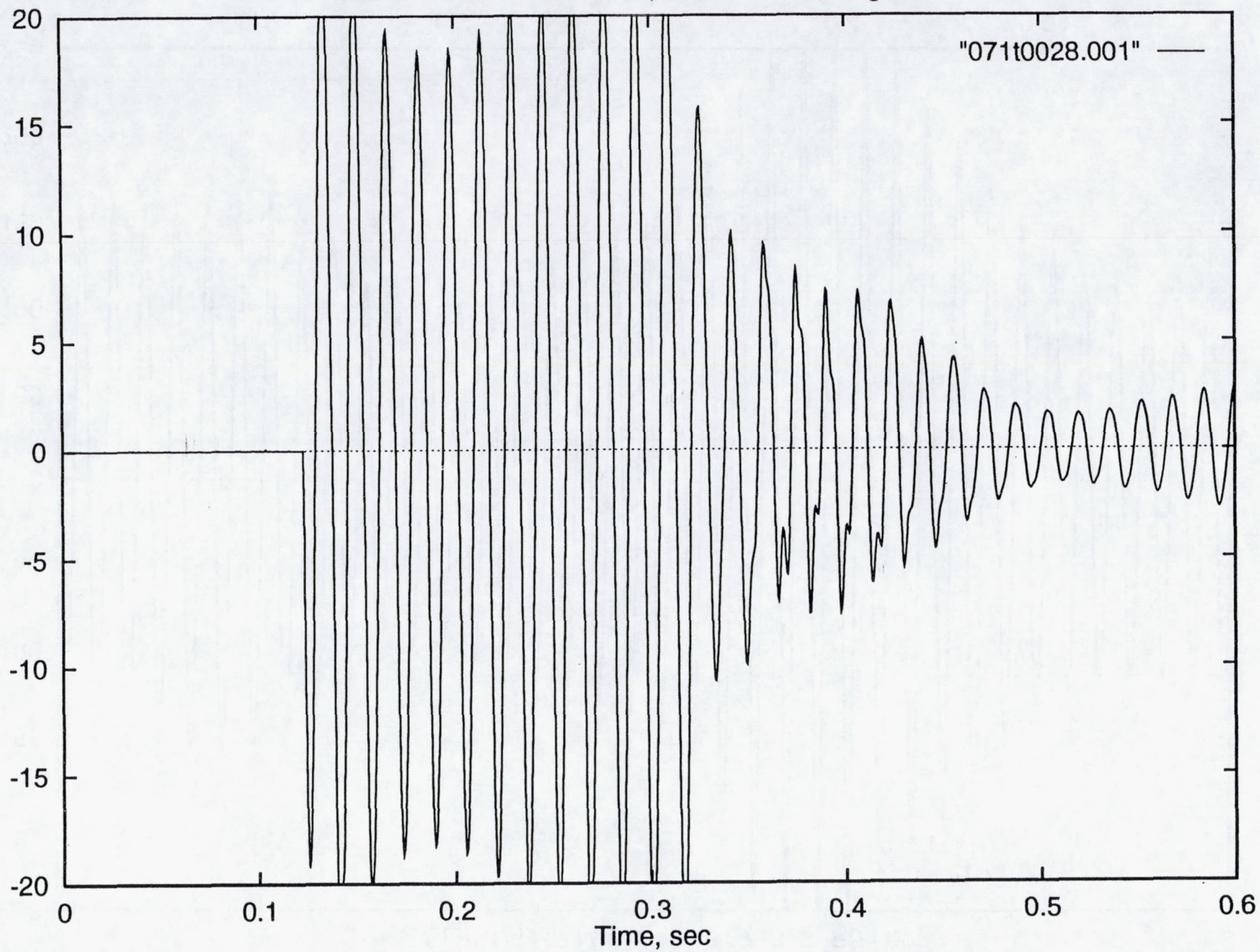


Figure 5-7a

SPRE Start 1/6 HP Motor; File: 071393, Rdg 0028

Aux Load Current, Amps



SPRE Start 1/6 HP Motor; File: 071393, Rdg 0028

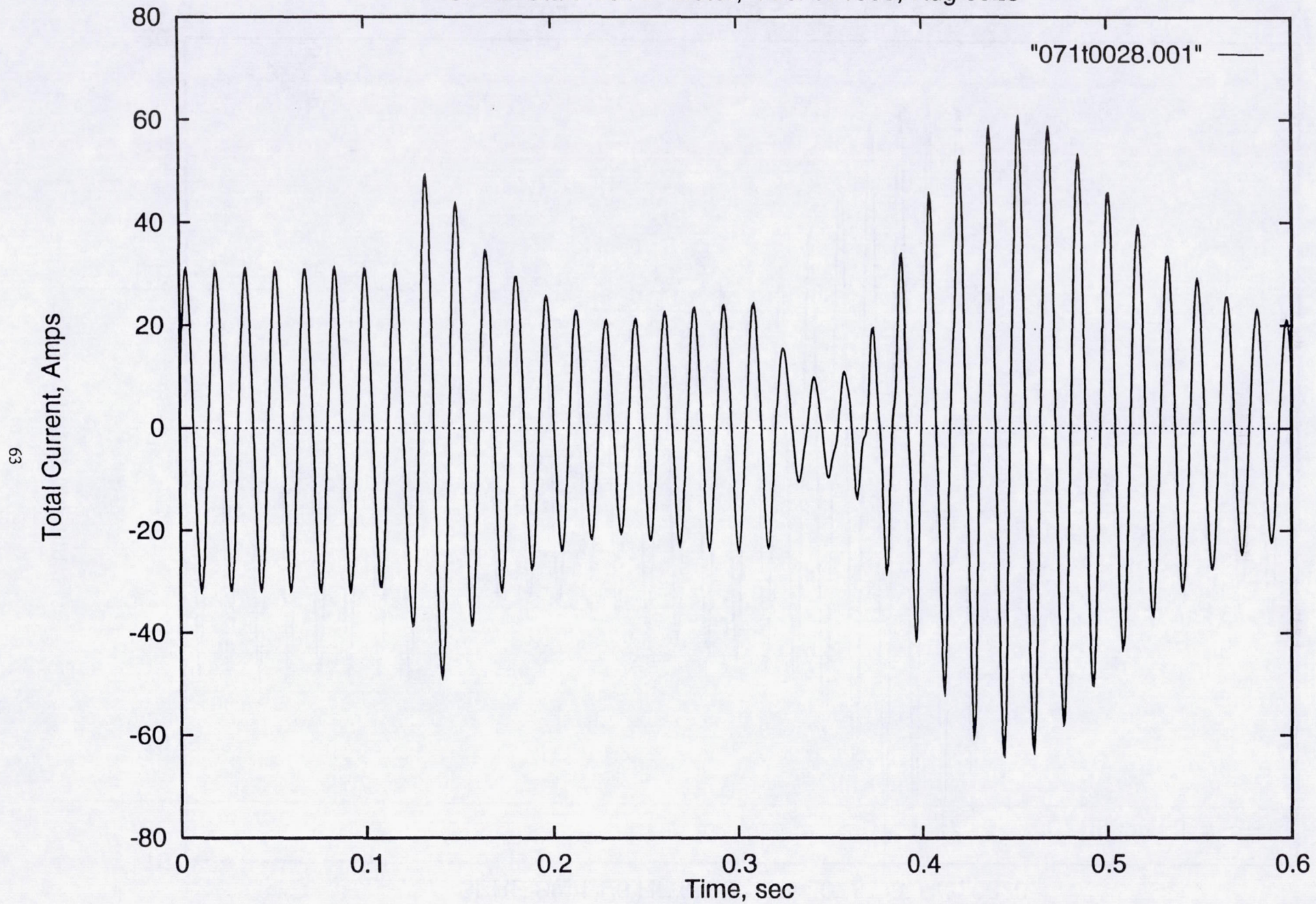
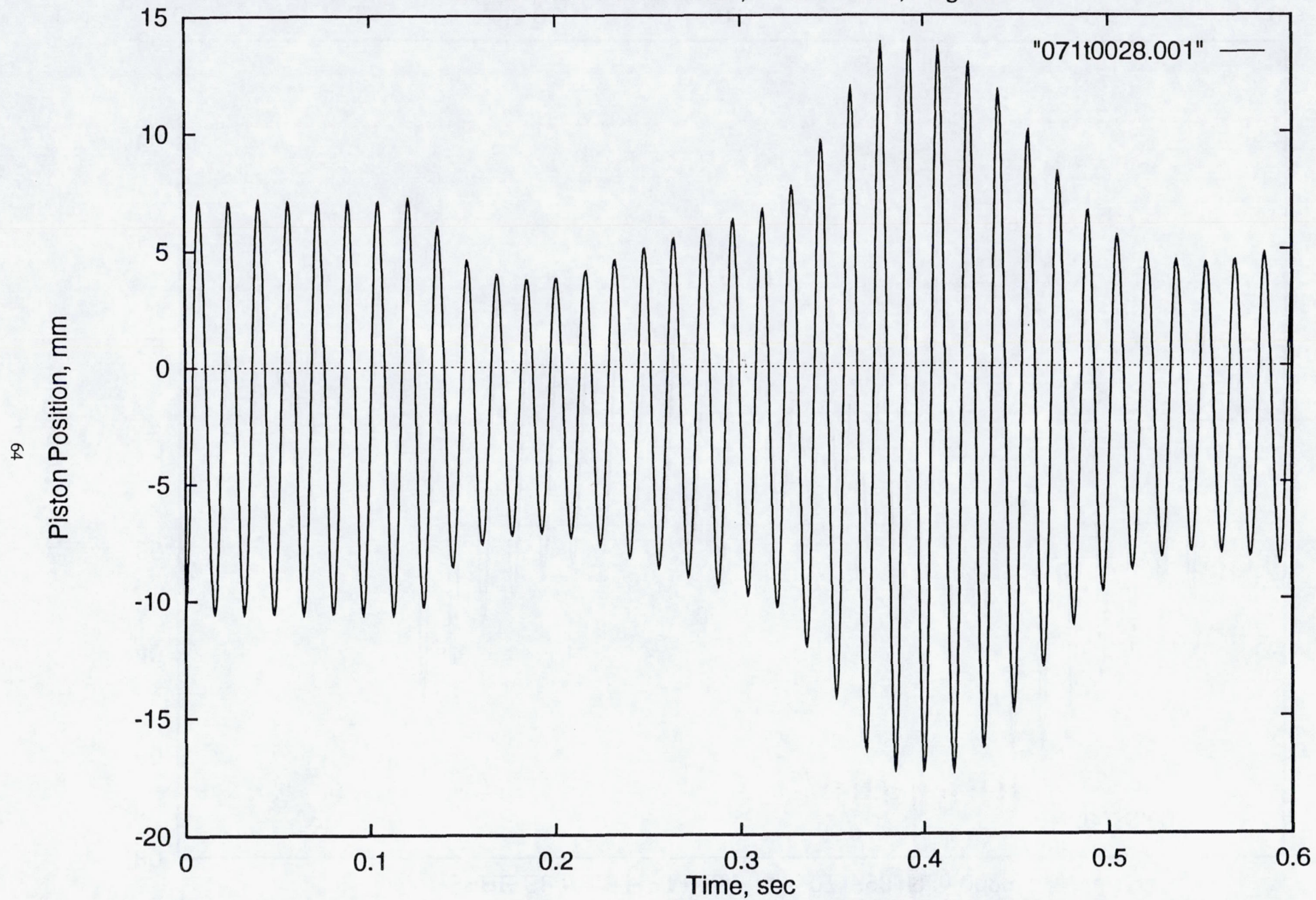


Figure 5-7c

SPRE Start 1/6 HP Motor; File: 071393, Rdg 0028



SPRE Start 1/6 HP Motor; File: 071393, Rdg 0028

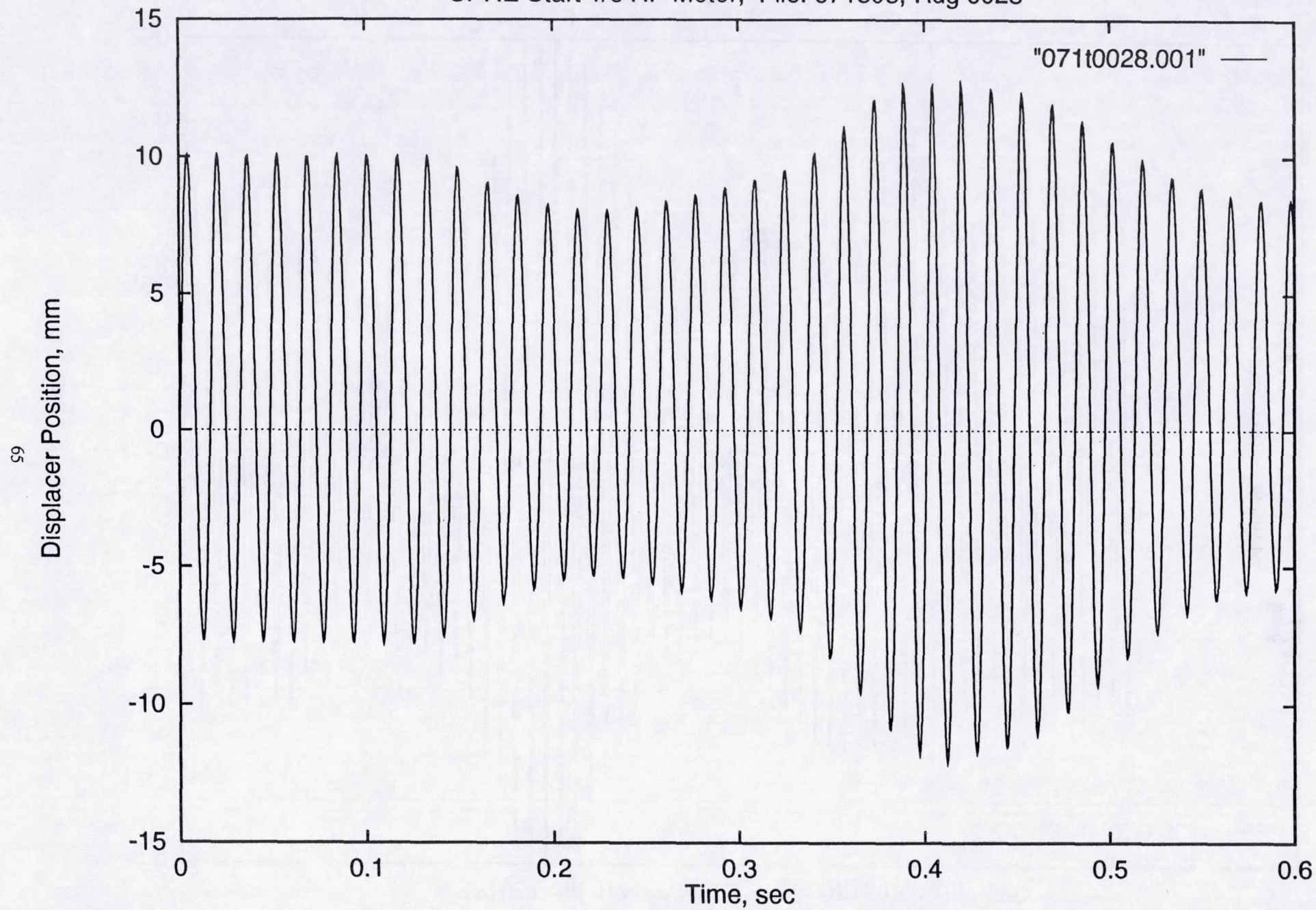
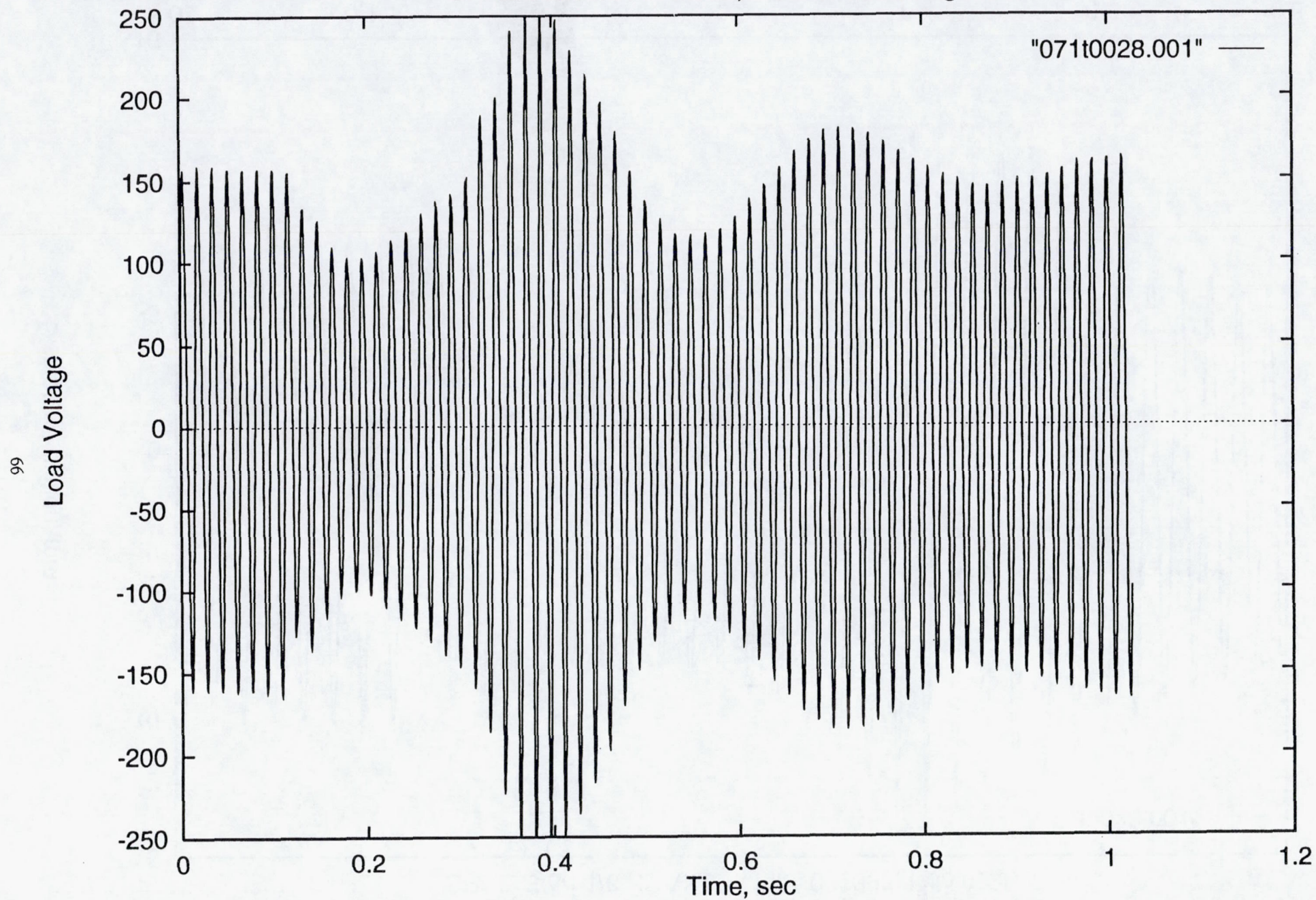


Figure 5-7e

SPRE Start 1/6 HP Motor; File: 071393, Rdg 0028



SPRE Start 1/6 HP Motor; File: 071393, Rdg 0028

69
Aux Load Current, Amps

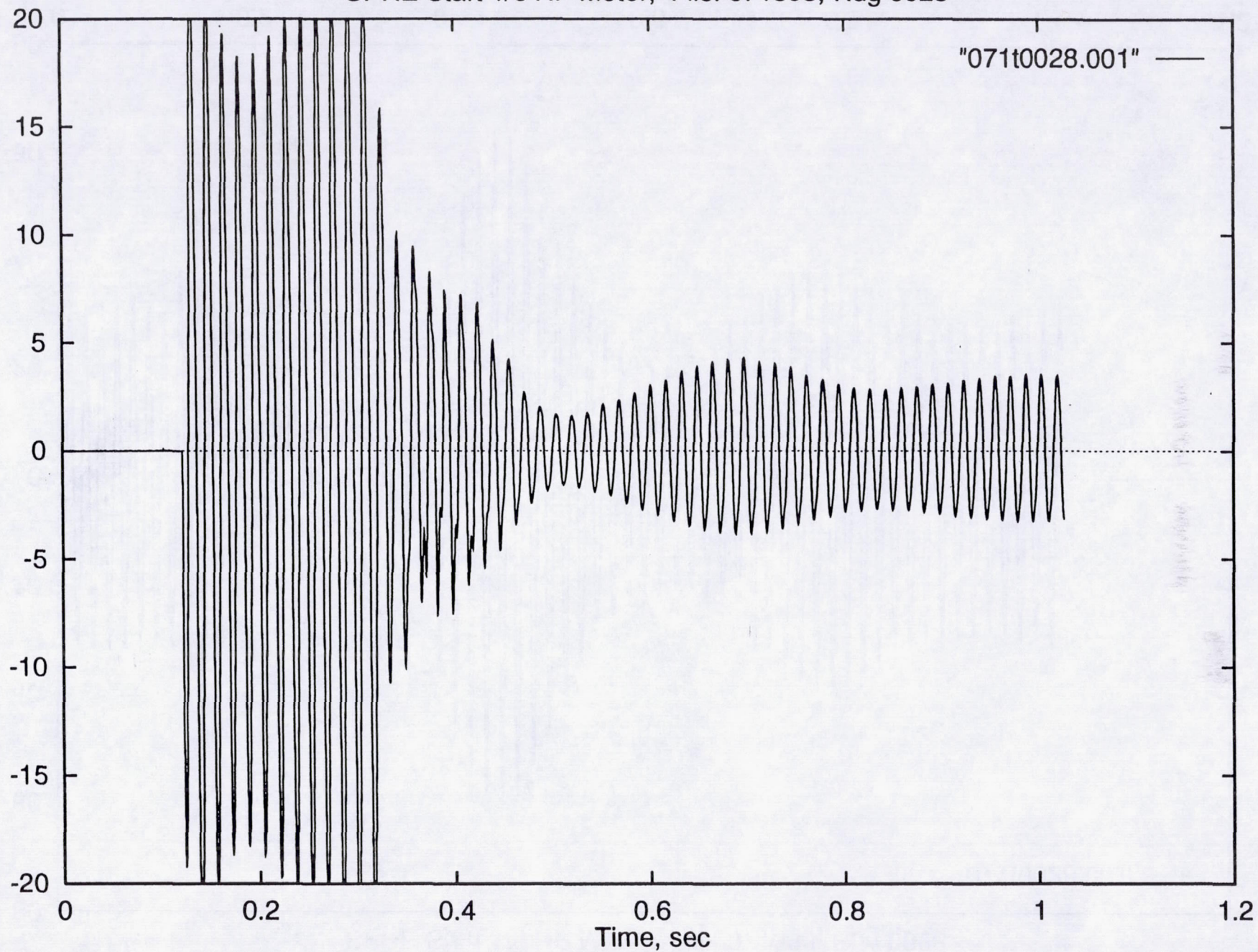
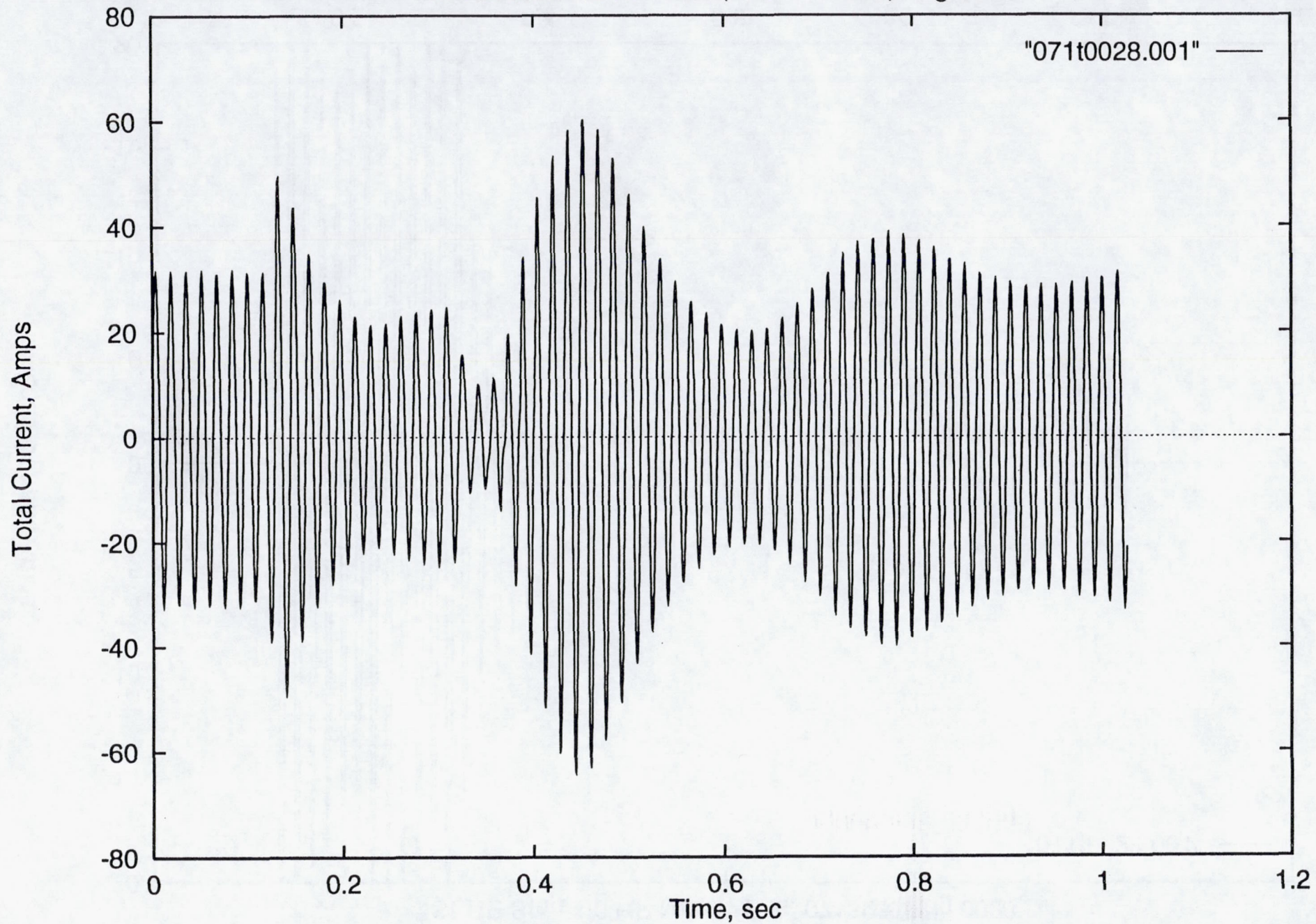


Figure 5-8b

SPRE Start 1/6 HP Motor; File: 071393, Rdg 0028



SPRE Start 1/6 HP Motor; File: 071393, Rdg 0028

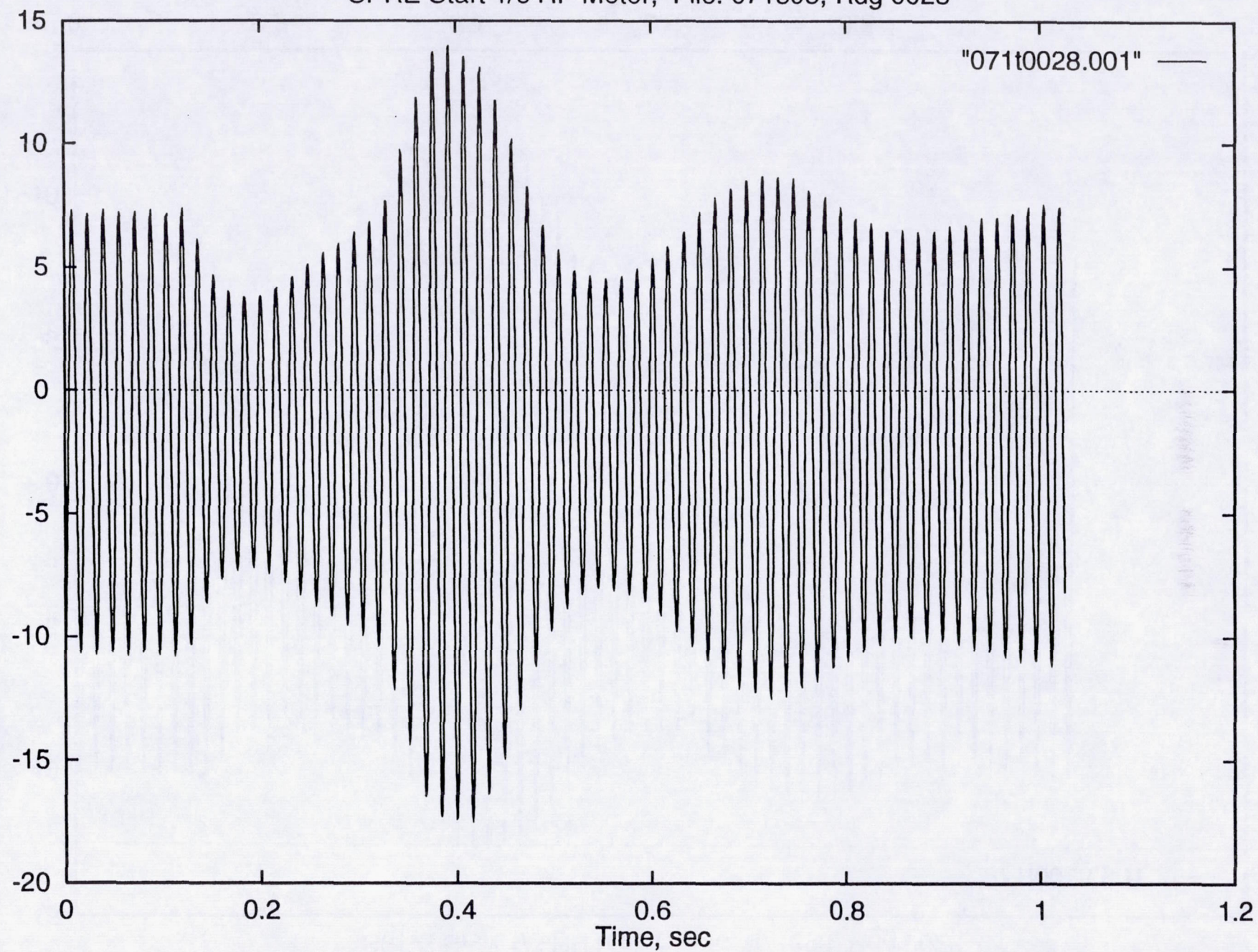
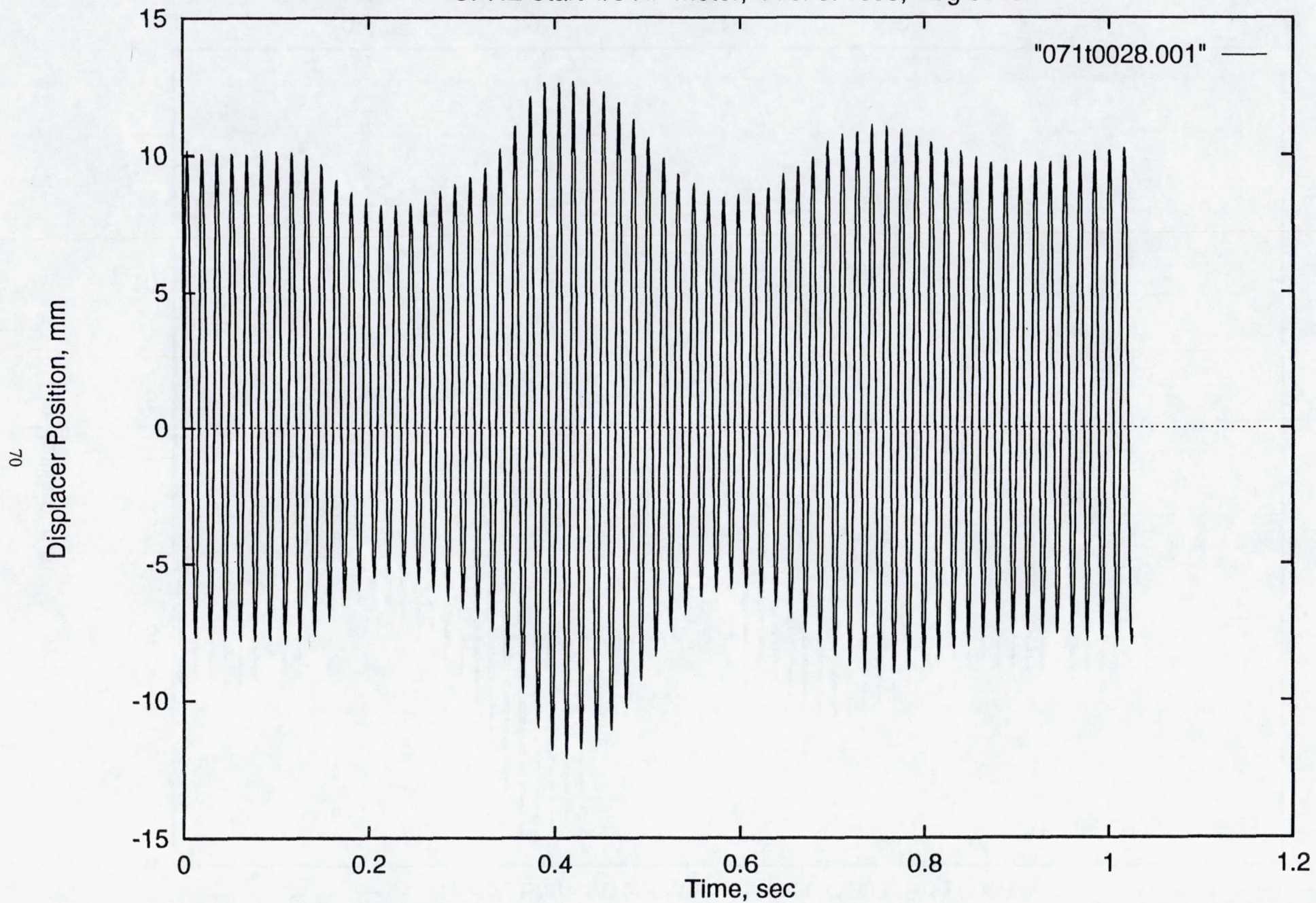


Figure 5-8d

SPRE Start 1/6 HP Motor; File: 071393, Rdg 0028



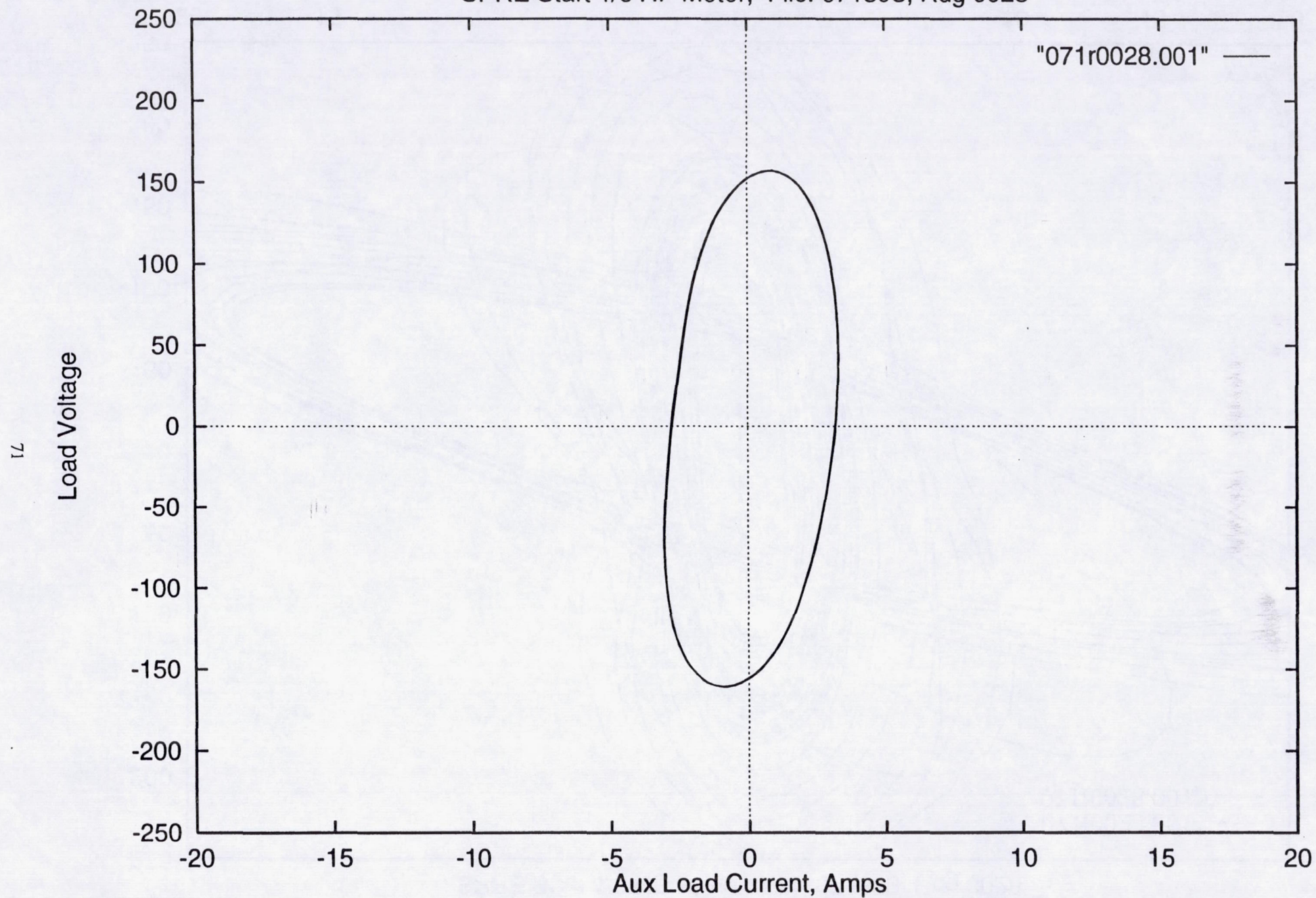
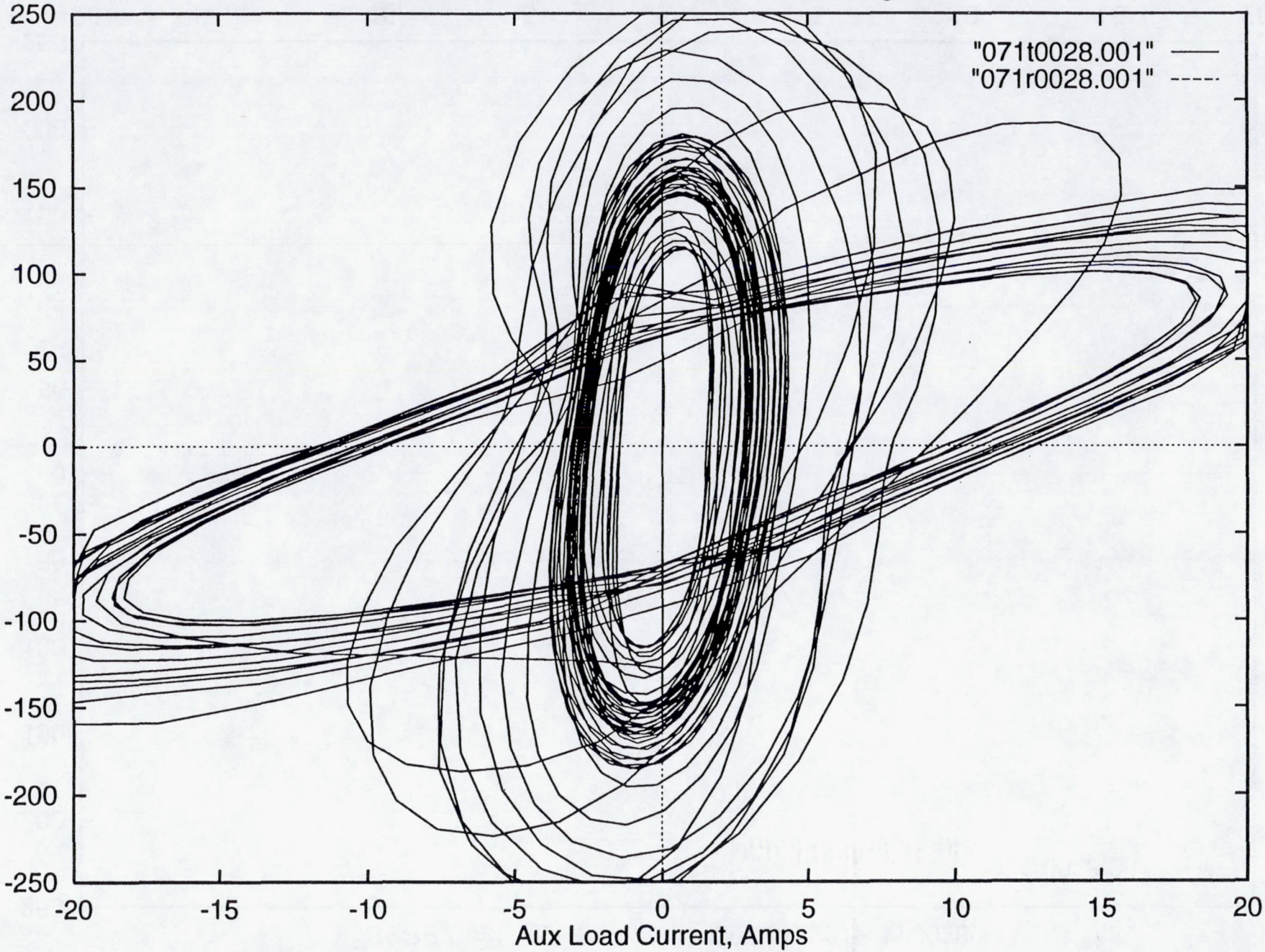


Figure 5-8f



SPRE Stop 1/6 HP Motor; File: 071393, Rdg 0030

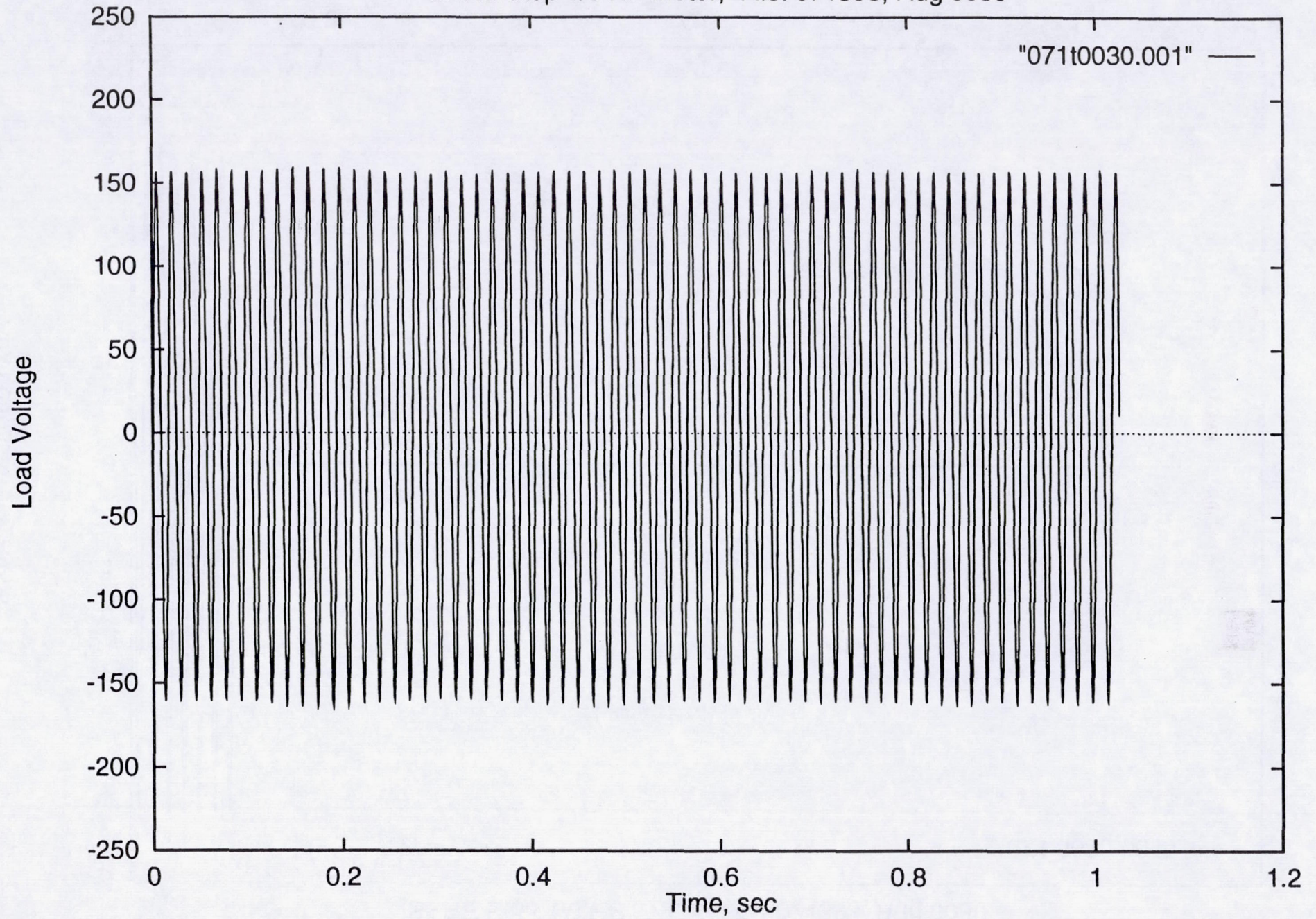
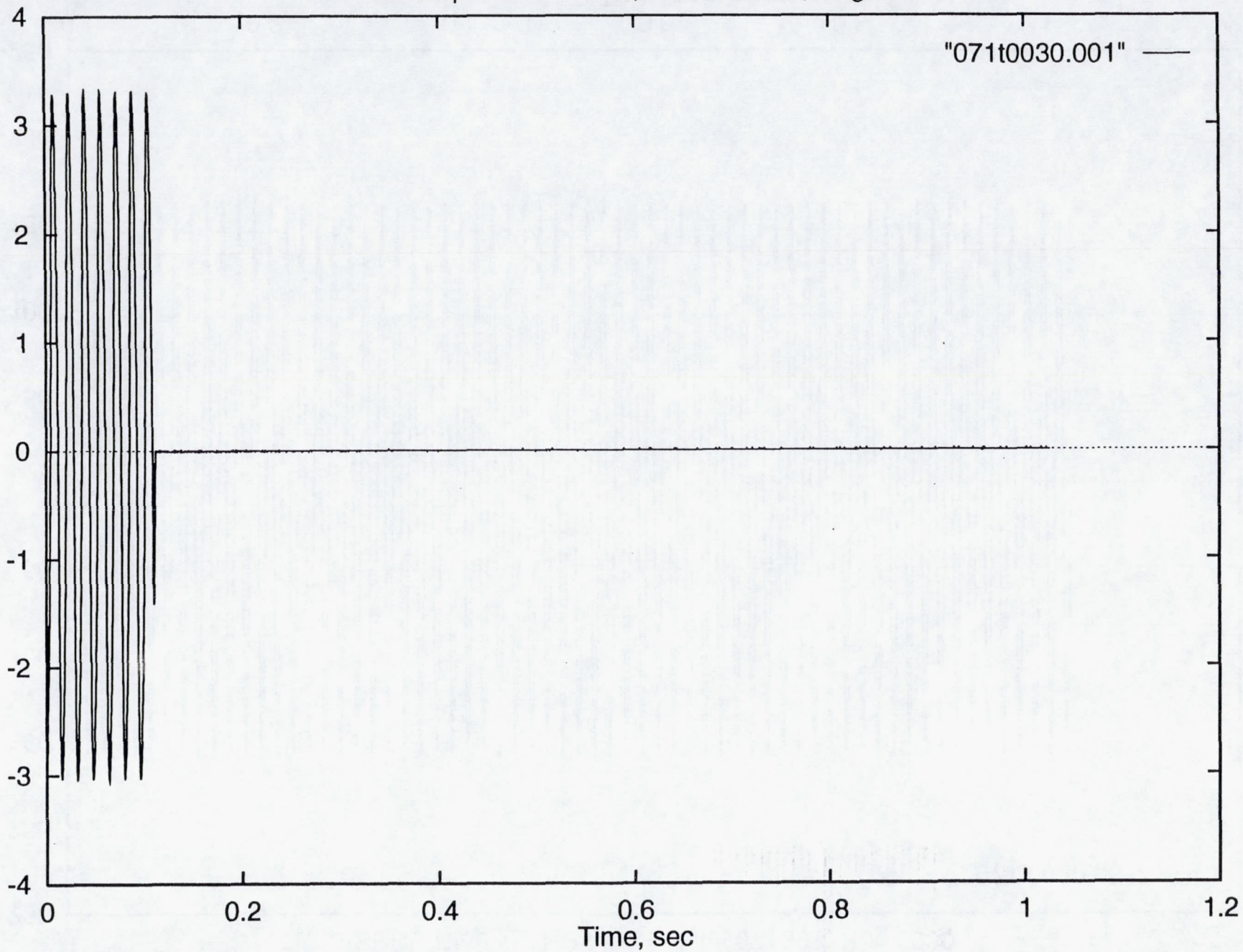


Figure 5-9a

SPRE Stop 1/6 HP Motor; File: 071393, Rdg 0030

Aux Load Current, Amps

"071t0030.001"



SPRE Stop 1/6 HP Motor; File: 071393, Rdg 0030

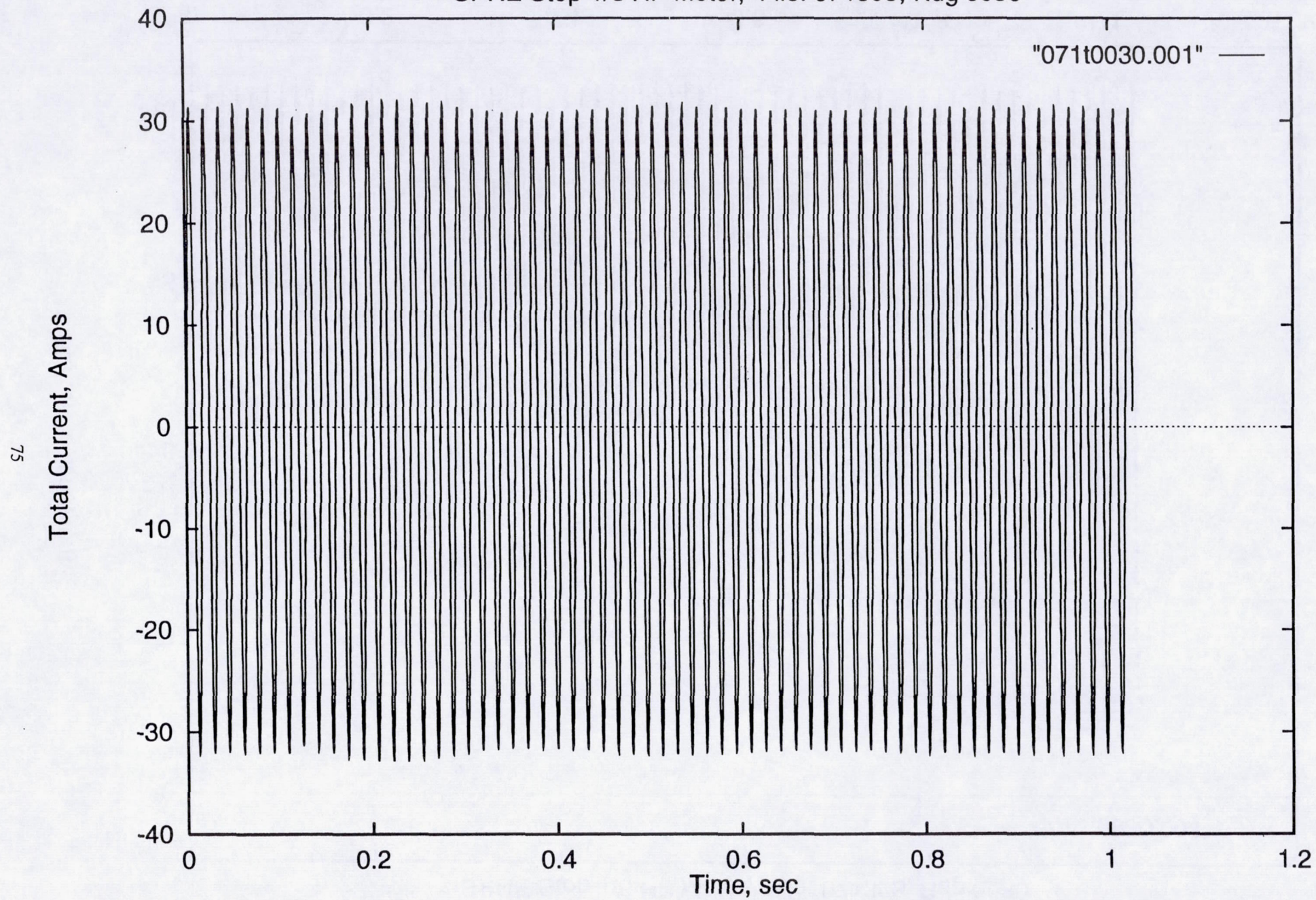
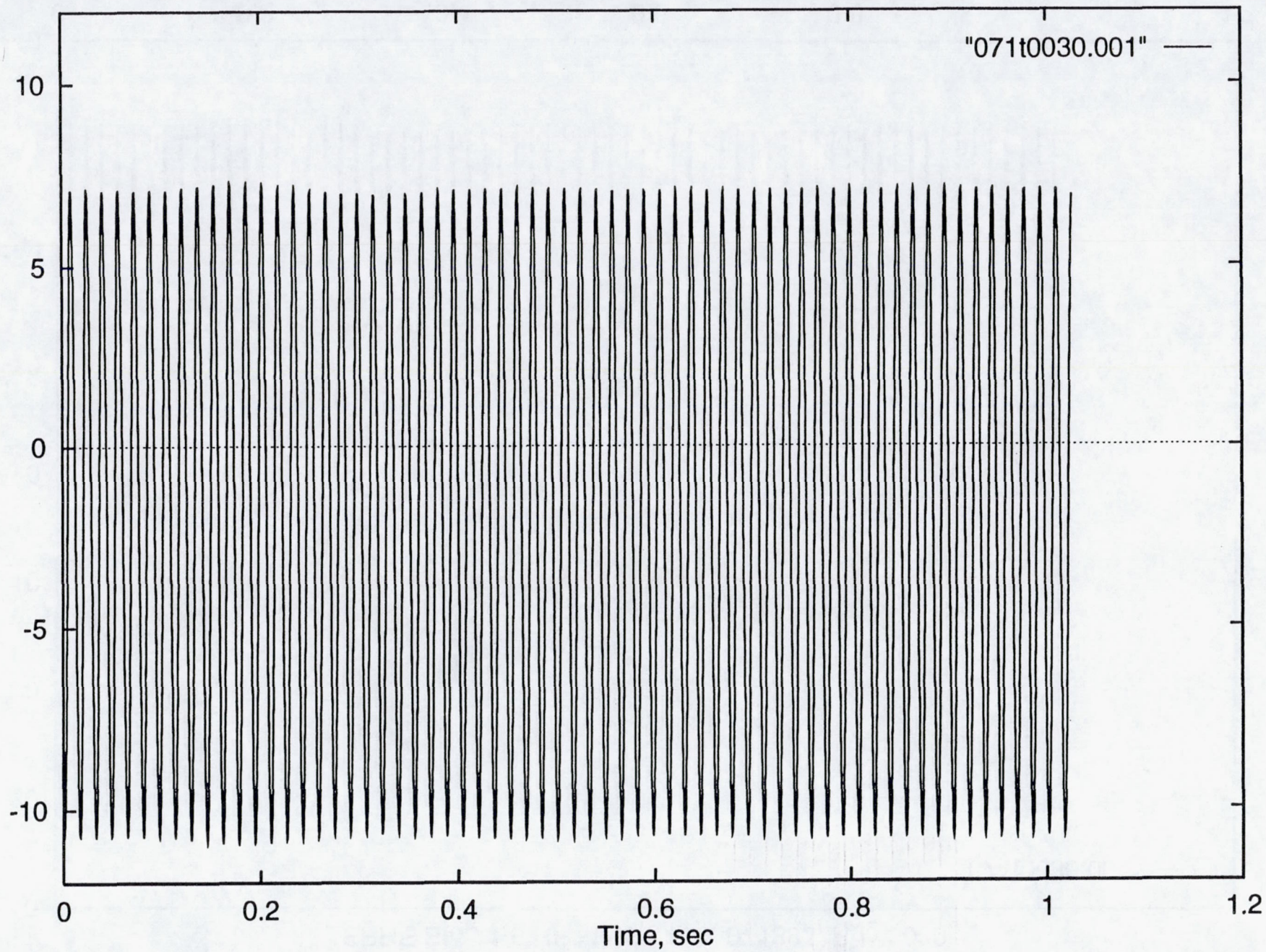


Figure 5-9c

SPRE Stop 1/6 HP Motor; File: 071393, Rdg 0030

Piston Position, mm

76



SPRE Stop 1/6 HP Motor; File: 071393, Rdg 0030

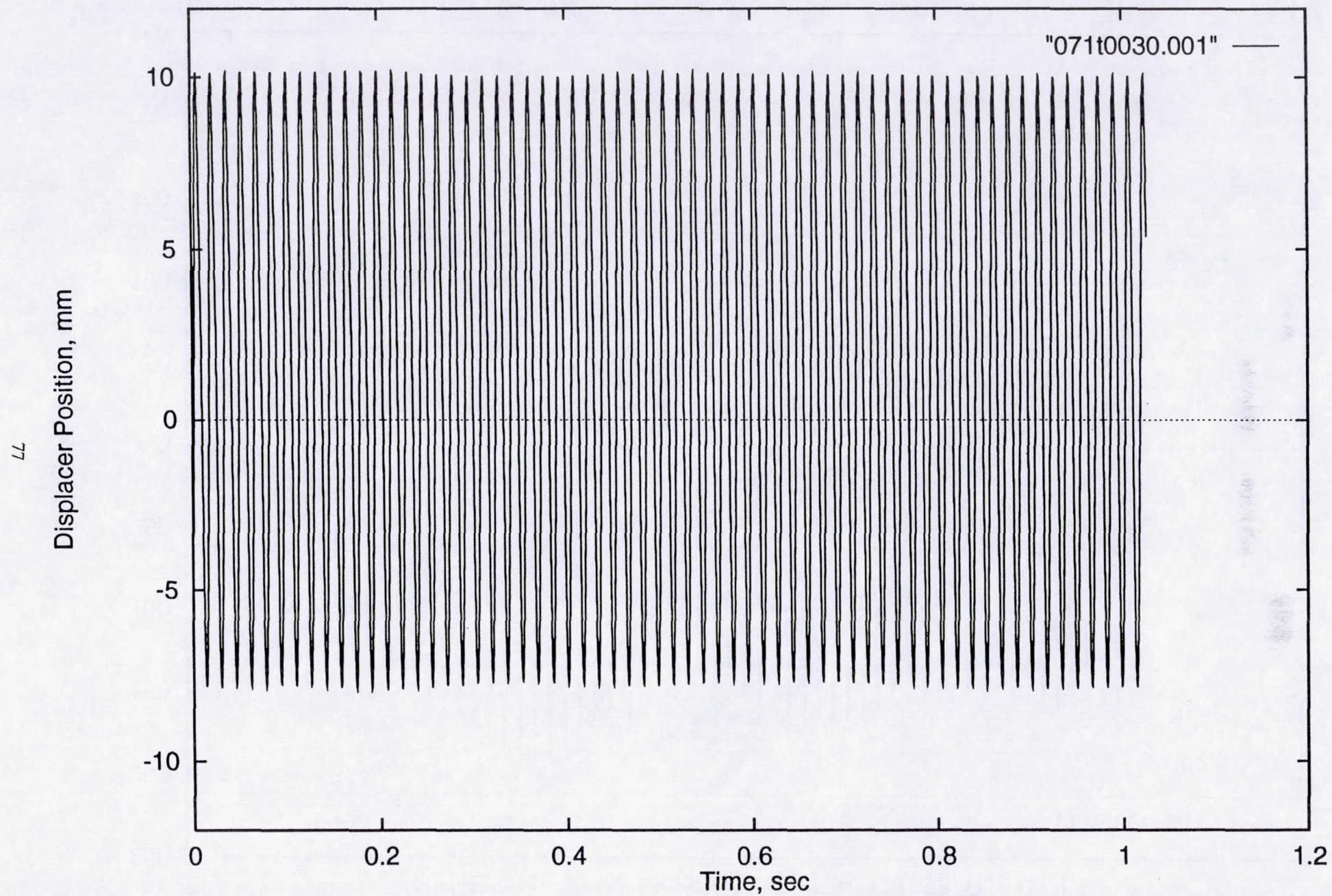
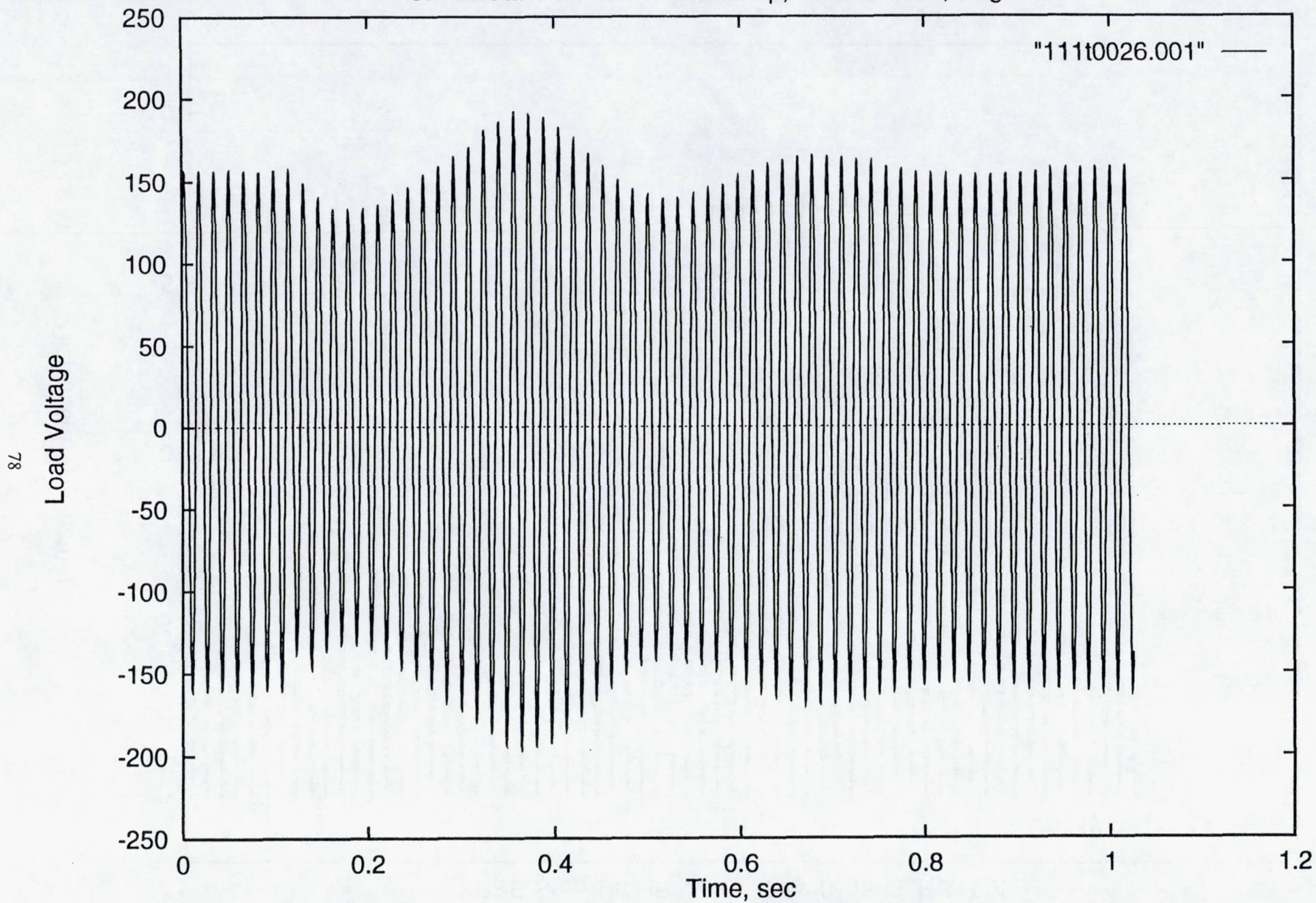


Figure 5-9e

SPRE Start 1/6 HP Motor w/ Cap; File: 111893, Rdg 0026



Aux Load Current, Amps

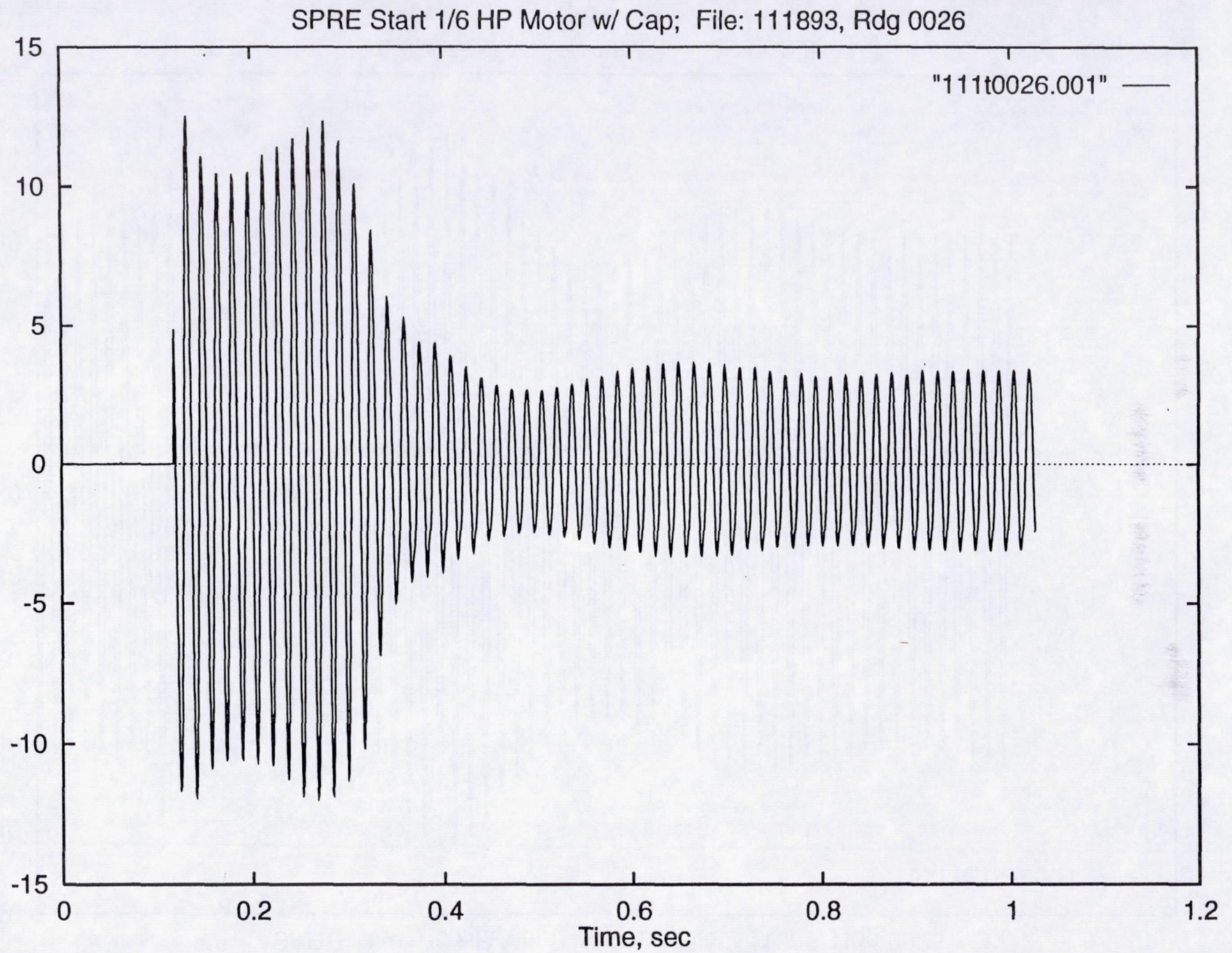
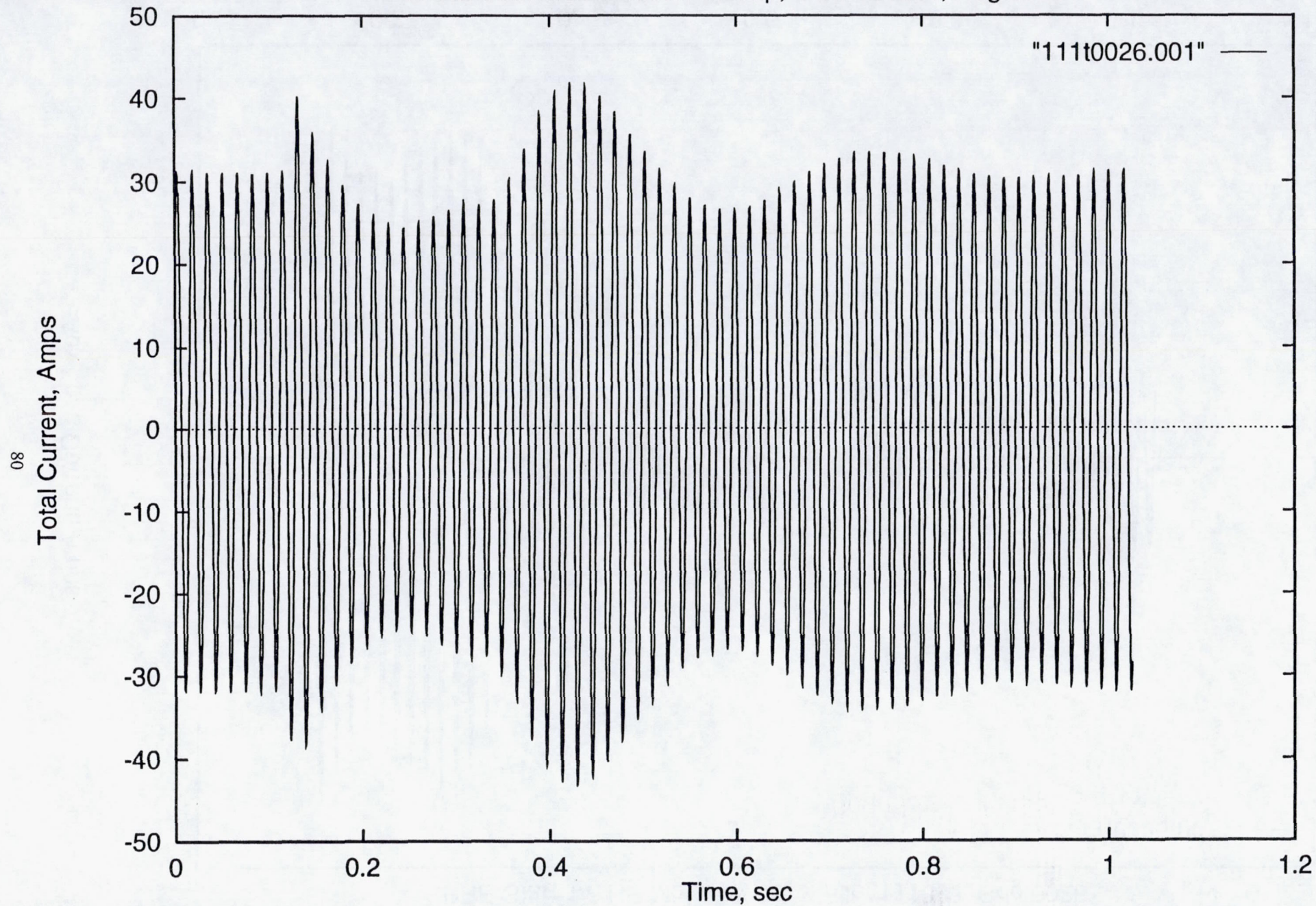


Figure 5-10b

SPRE Start 1/6 HP Motor w/ Cap; File: 111893, Rdg 0026



Piston Position, mm

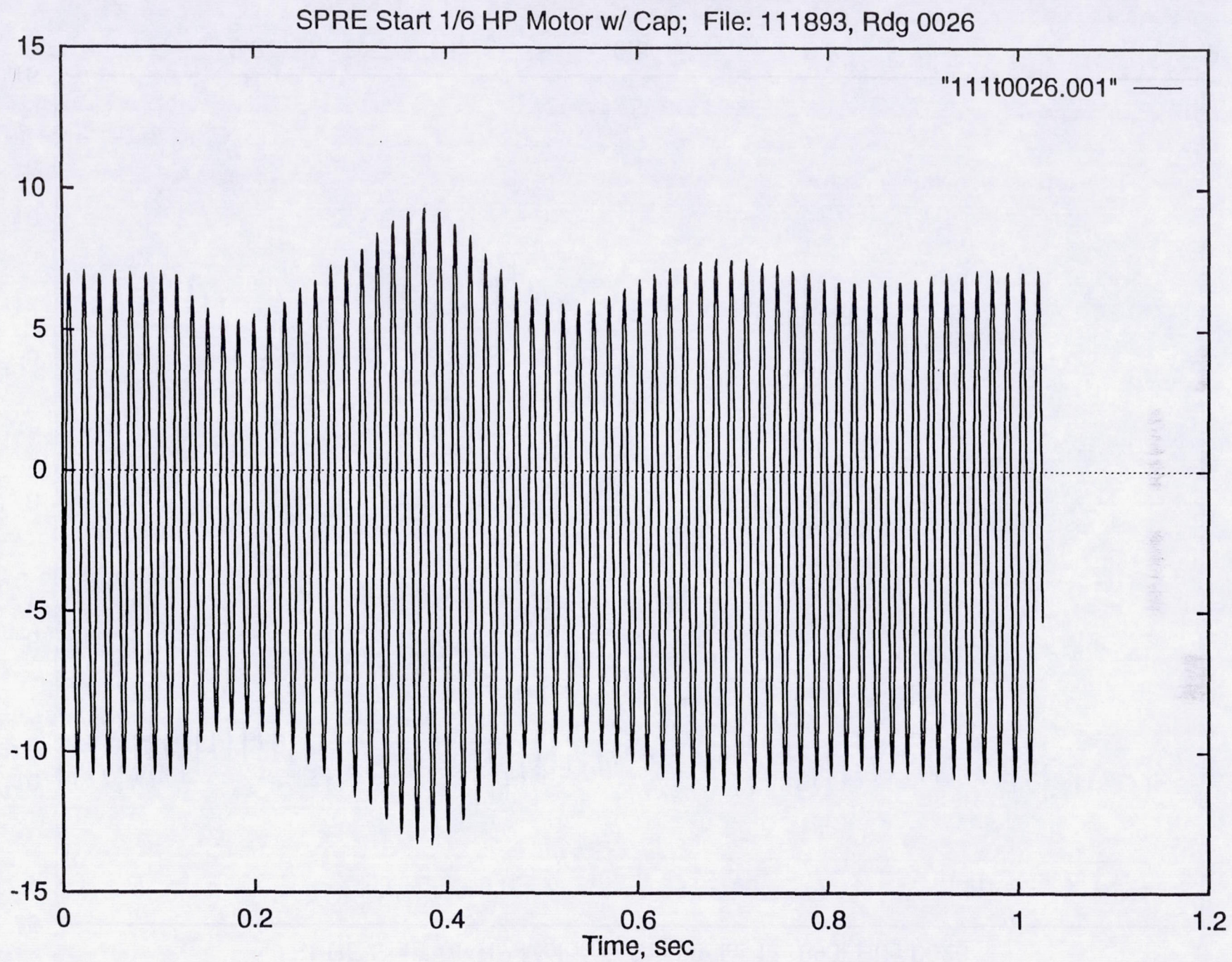
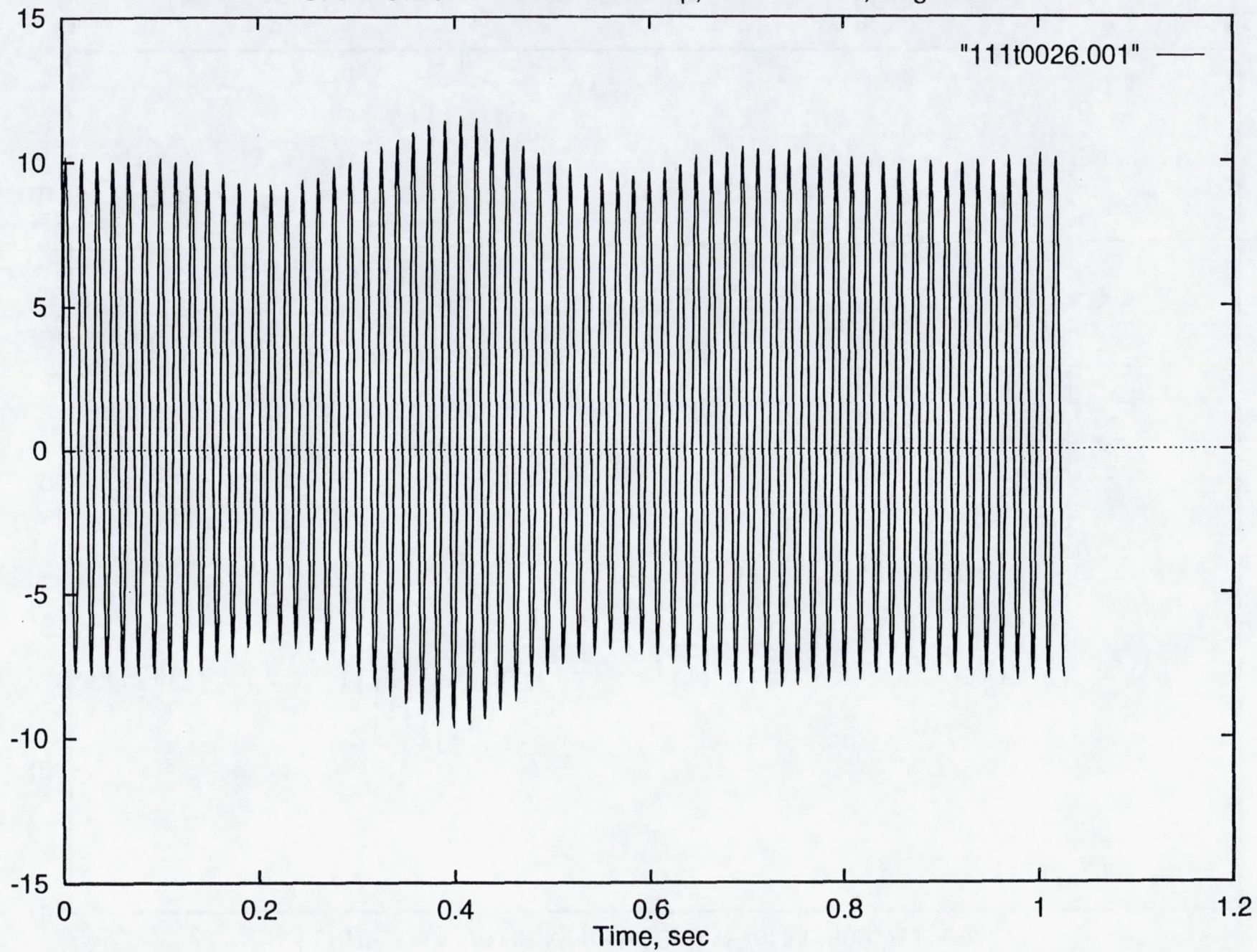


Figure 5-10d

SPRE Start 1/6 HP Motor w/ Cap; File: 111893, Rdg 0026

82
Displacer Position, mm



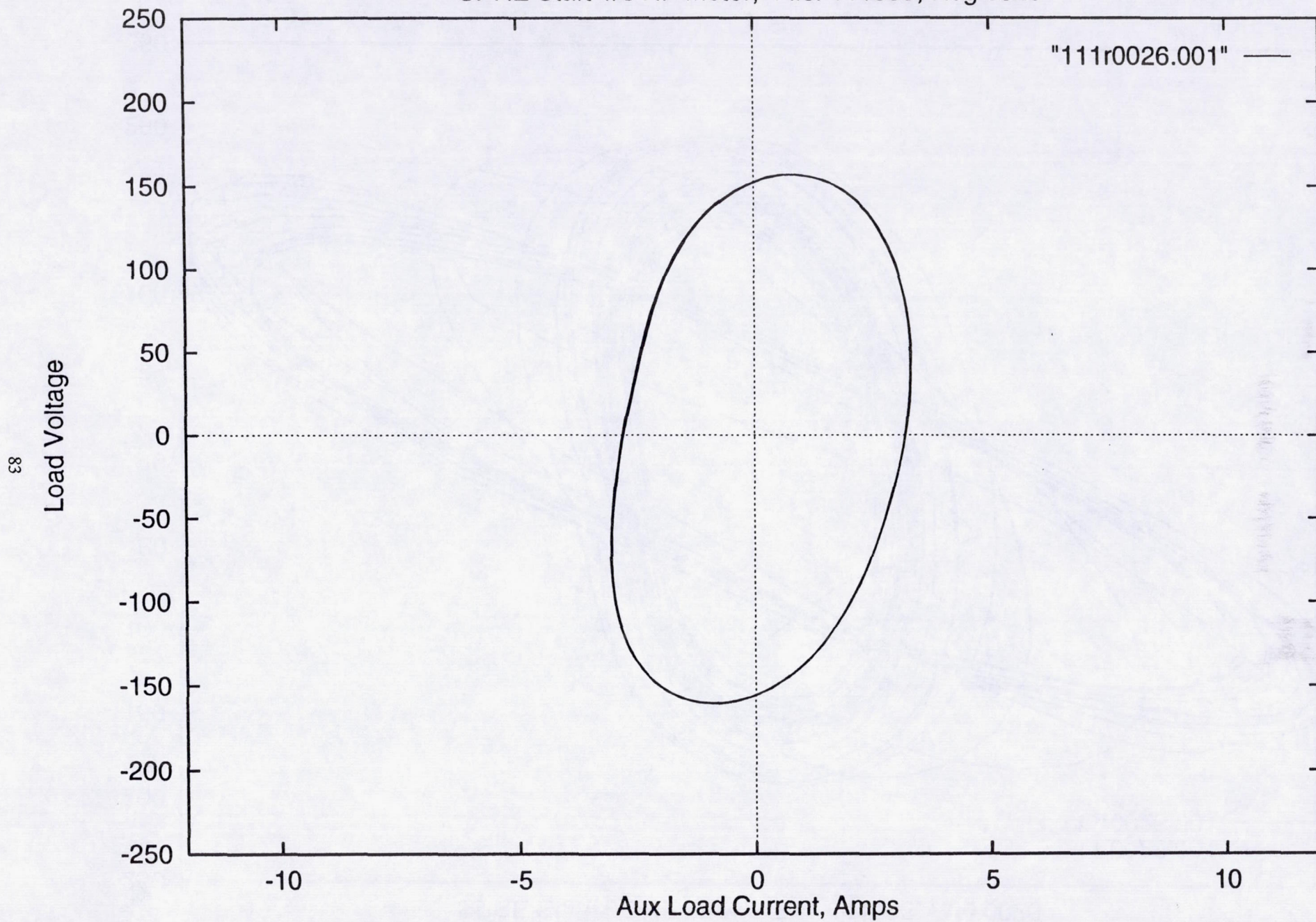
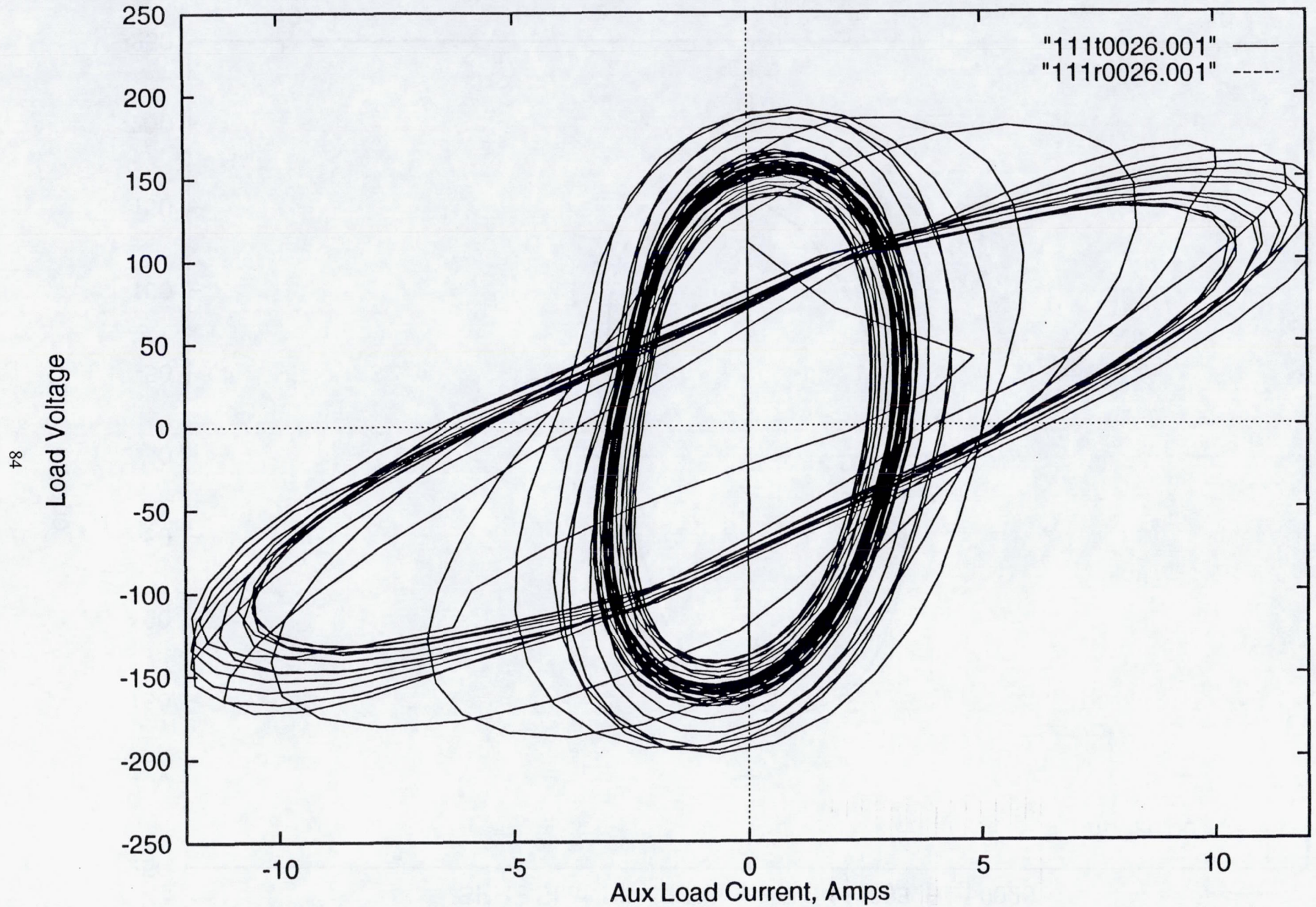


Figure 5-10f

SPRE Start 1/6 HP Motor; File: 111893, Rdg 0026



SPRE Start 1/5 HP Motor-Fan; File: 121793, Rdg 0018

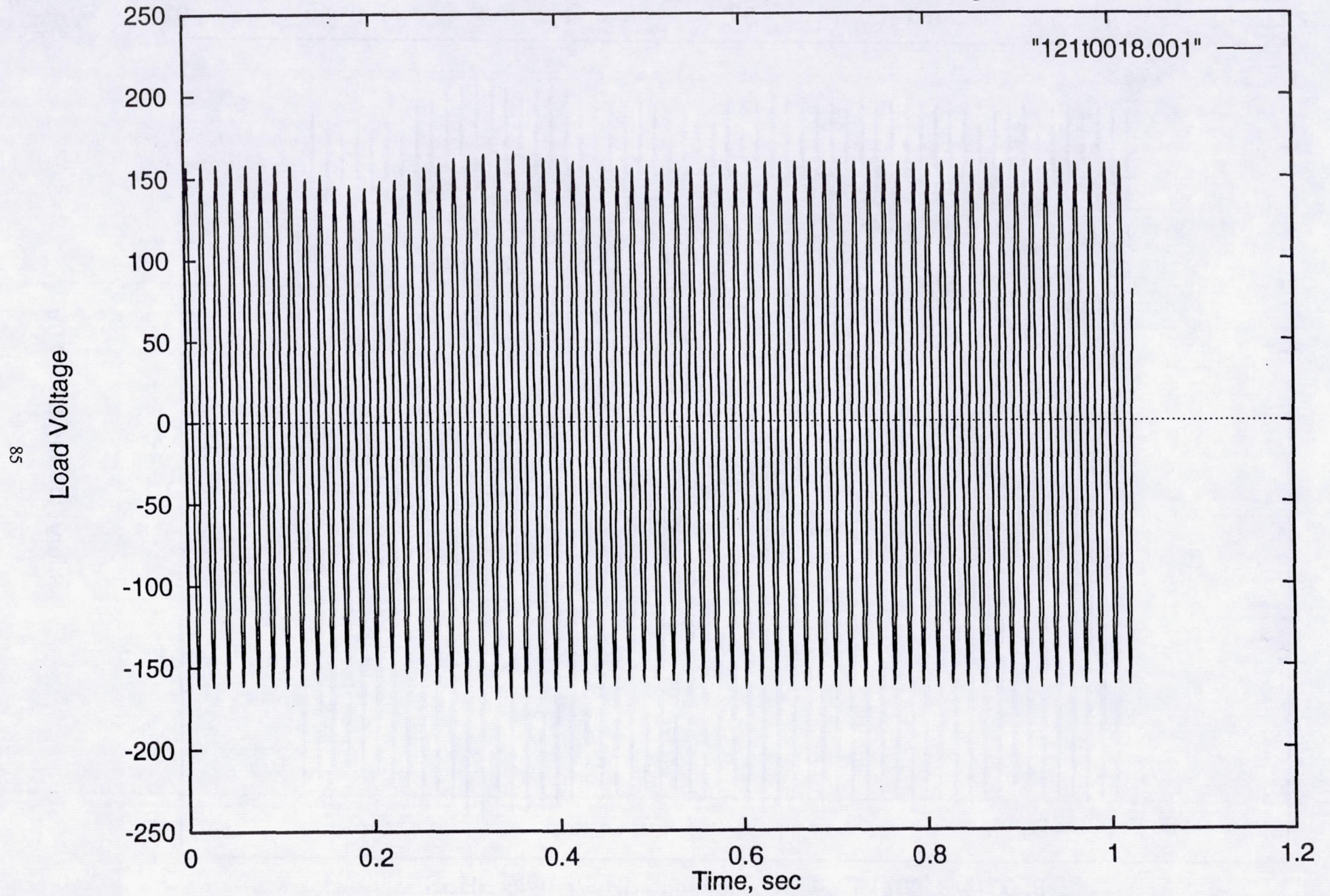
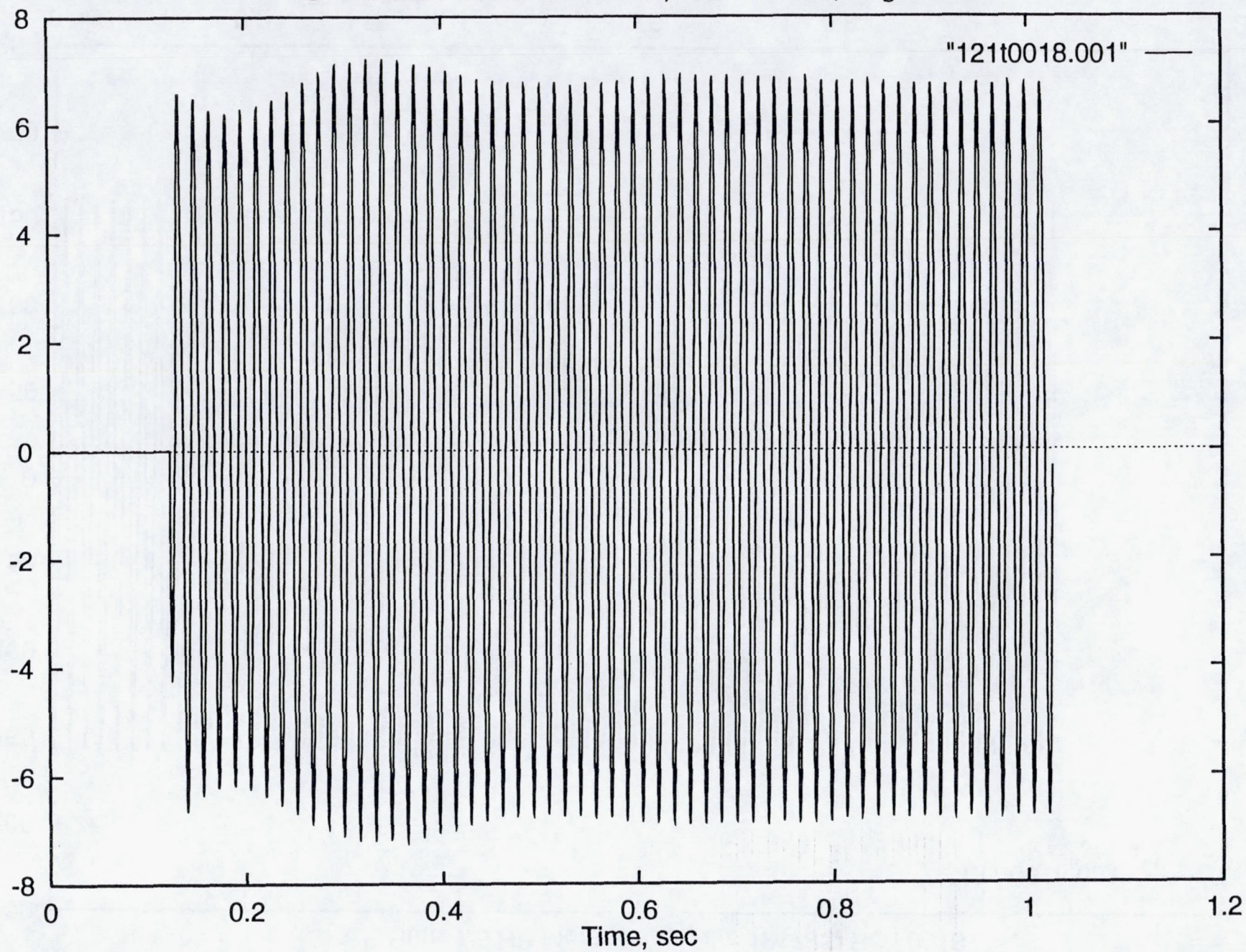


Figure 5-11a

SPRE Start 1/5 HP Motor-Fan; File: 121793, Rdg 0018

98
Aux Load Current, Amps



Total Current, Amps

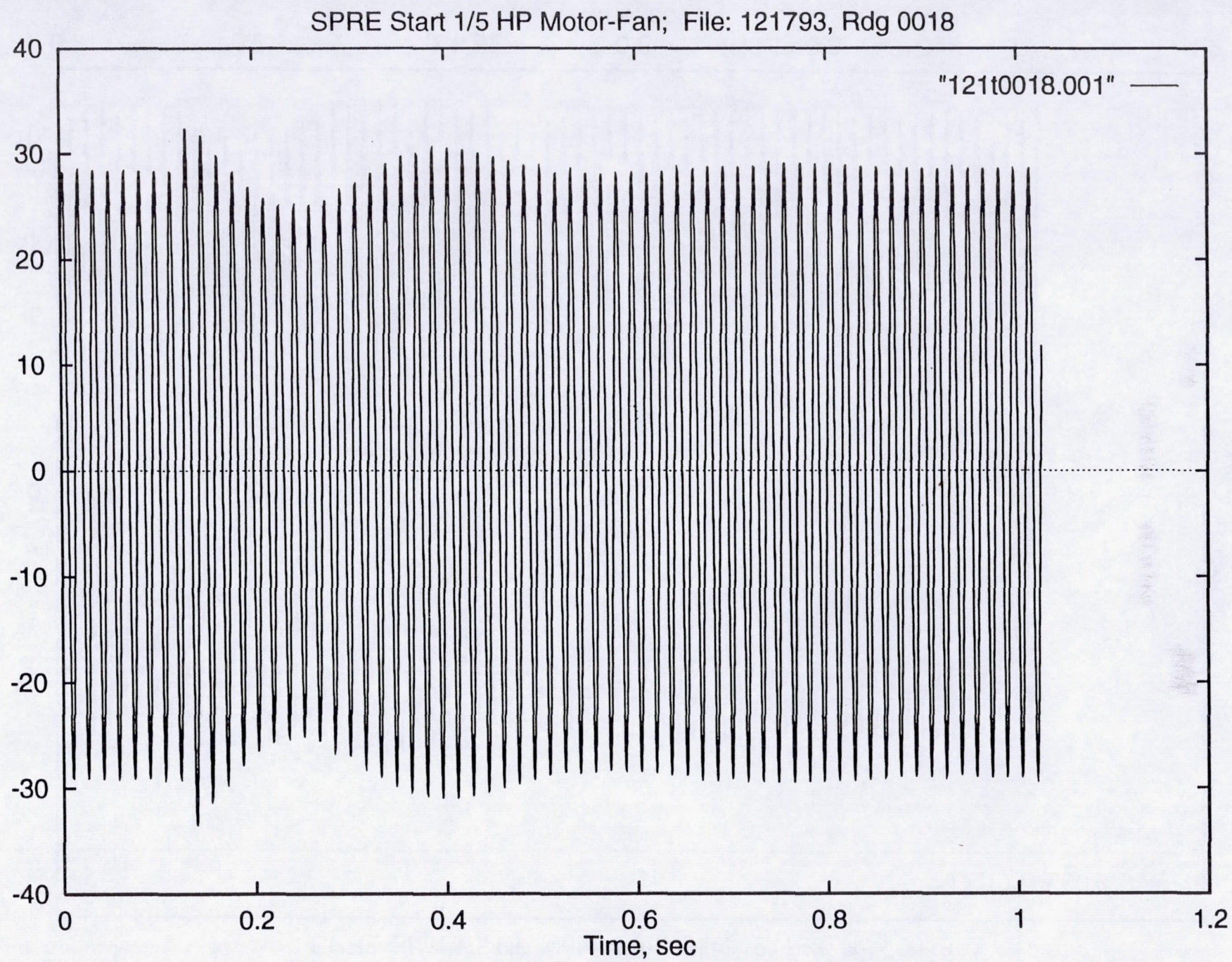
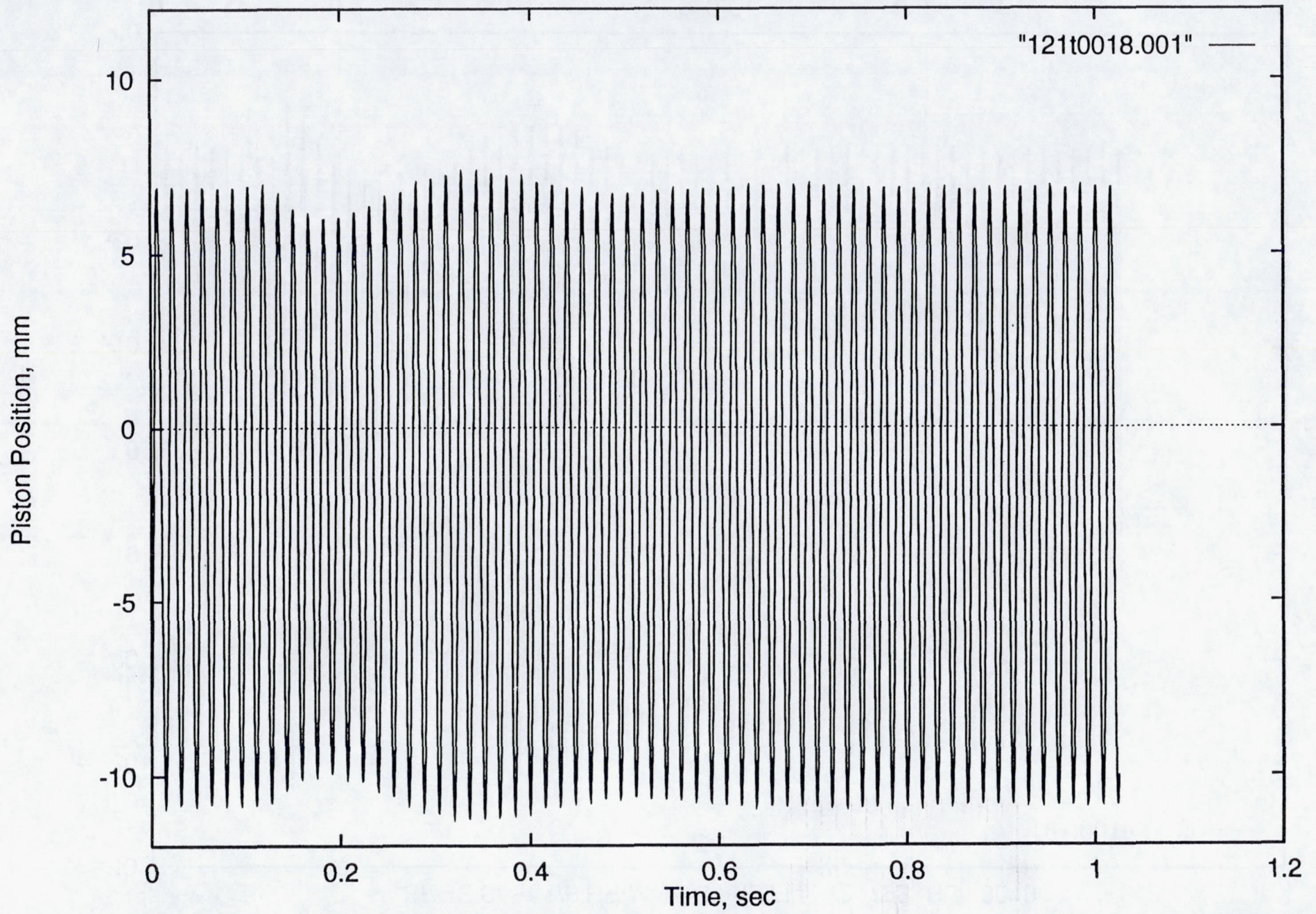
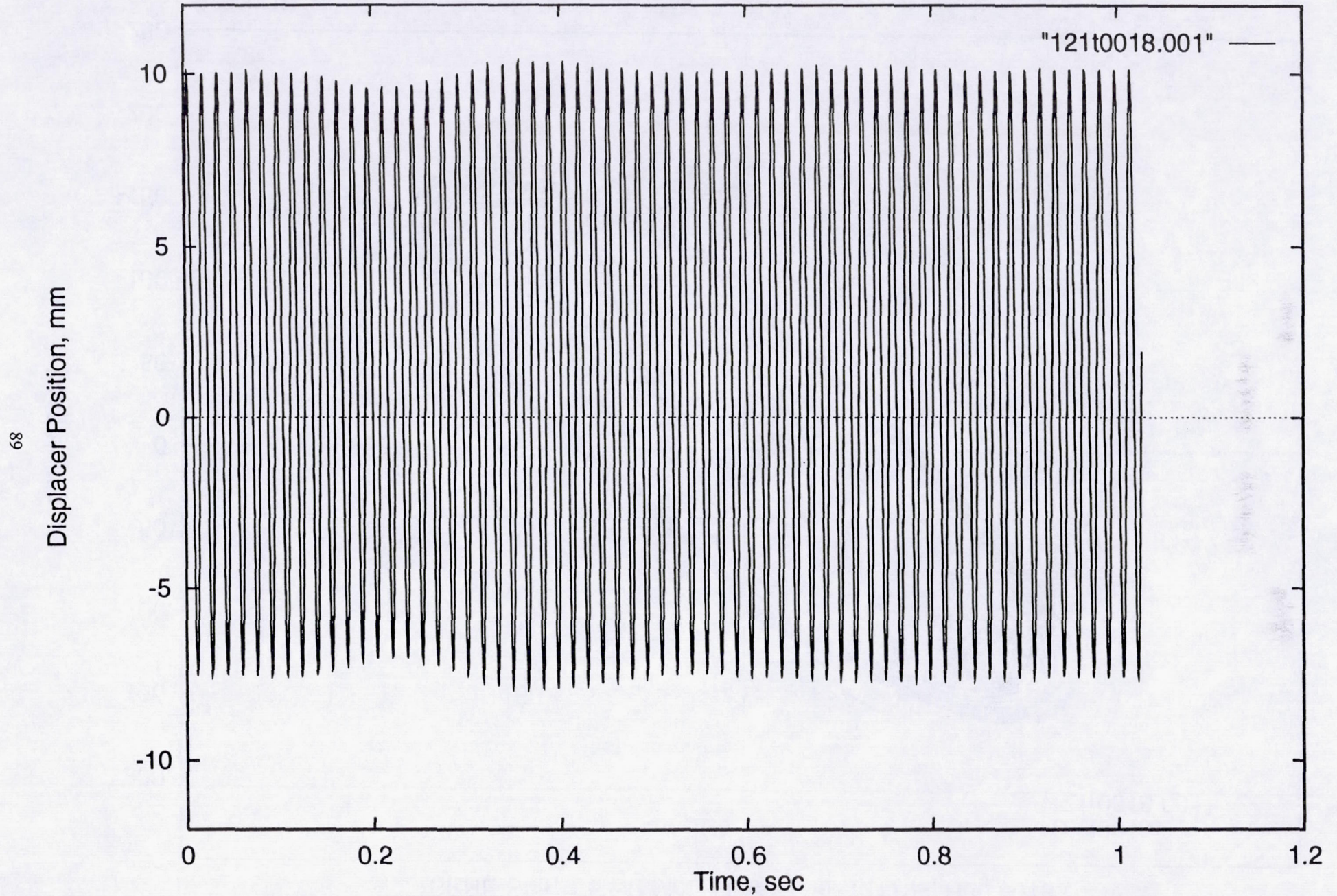


Figure 5-11c

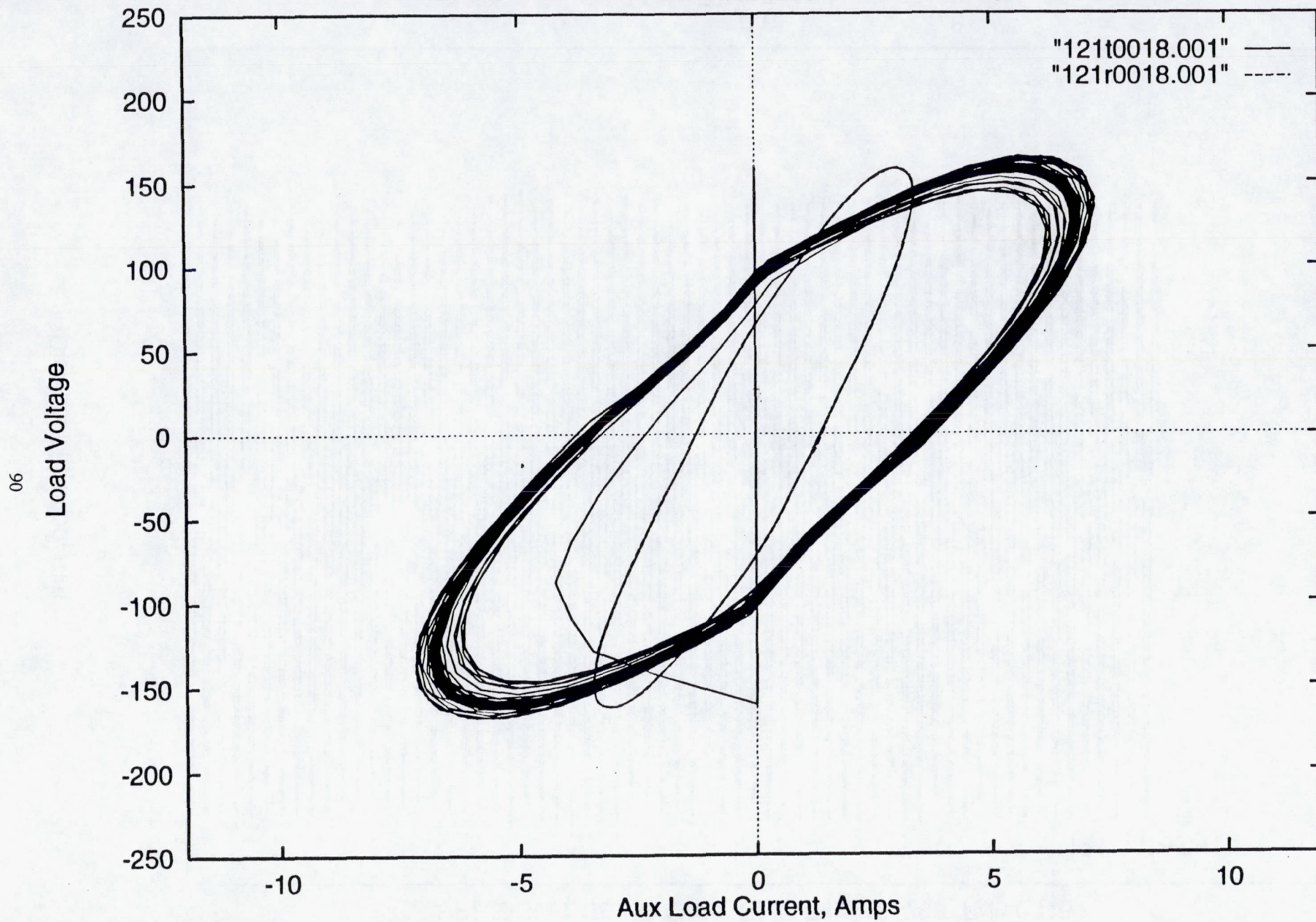
SPRE Start 1/5 HP Motor-Fan; File: 121793, Rdg 0018



SPRE Start 1/5 HP Motor-Fan; File: 121793, Rdg 0018



SPRE Start 1/5 HP Motor-Fan; File: 121793, Rdg 0018



Load Voltage

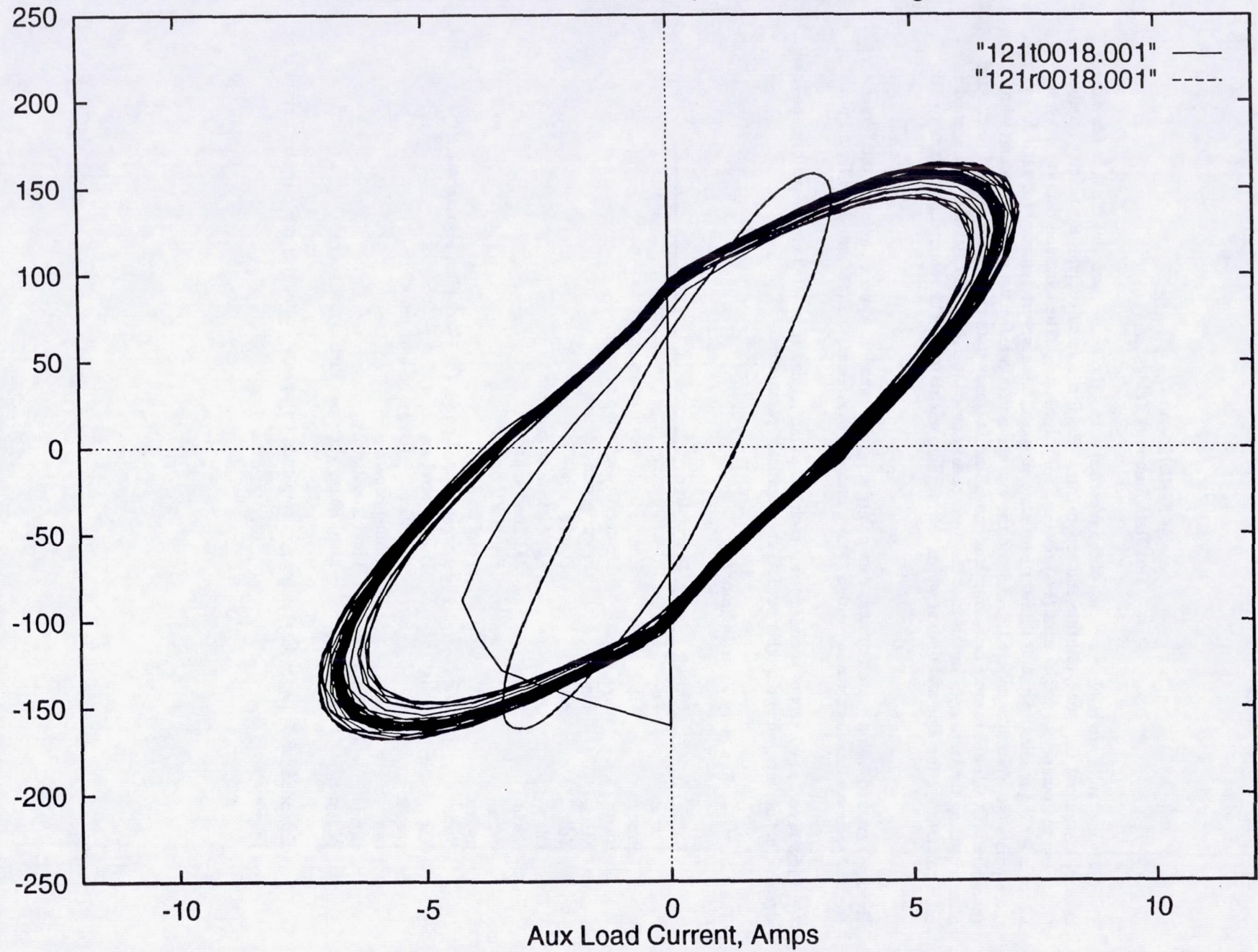


Figure 5-11f

APPENDIX - A

Test Data Summary Tables

The following tables are brief summaries of the recorded data. The header indicates the date file name, channel assignment file name, test title and report date. The first column contains the reading number (Rdg) and the number of single scans (Pts) obtained for this reading. The tabulated data is the average of all scans for the reading. Since, for most steady-state readings, 5 scans were recorded for each data point, these points are typically numbered XX.05 and the average is over 5 individual scans. Readings with 2 scans (numbered XX.02) are in most cases transient points since a steady-state reading is recorded before and after triggering the transient. In this case the average may have little or no significance. The second and third columns are the date and time at which each reading was started. The remaining columns contain data.

Readings marked with a † are transient data points, several of which have been plotted in the "Transient Results" section. Readings marked with a (*) are included in Appendix - B, "Steady-State Data Points."

Appendix A contains 2 sets of summaries for each test. One set lists the overall engine performance and dynamic parameters, while the other set lists the alternator parameters.

Table A-1 Summary Table Definitions

Label	Units	Description
Pmean	Pa	Absolute mean engine pressure
Freque	Hz	Engine frequency (from dynamic channel)
trtow	K/K	Heater/Cooler temp ratio
Xp	mm	Power piston position
Xd	mm	Displacer position
Ialt	Amps	AC Alternator current
Vacld	Volts	AC Load voltage
pvpst	kW	Piston PV power
pwacld	kW	Total load power
Kwalt	Kw	Alternator load power (by Clark-Hess instrument)
Vsp	volts	Load control set-point
etapvh	---	PV efficiency (based on heat input Qin)
cap	uf	Tuning capacitor
rload	ohms	Load Resistance
phasld	deg	Load Phase, (between vacld.p and ialt.p)

Extended labels (.a, .p & .r) denote an amplitude (.a), phase (.p) or root-mean-square (.r) for that parameter.

--- Summary Report --- Test Title: SPRE PC/TDAS Build 15
 FileName: 063093.dta, ChanFile: chspre05, Report Date: Tue Mar 15 15:19:35 1994

Rdg.Pt	Date	Time	pmean	Freque	trtow	XP.a	XD.a	XD.p	vacld.r	pvpst	kwalt	etapvh	vsp
1.01	06-30-93	07:55:00	2.6059e+00	0.0000e+00	1.6493e+00	0.0000e+00	0.0000e+00	0.0000e+00	4.1905e-02	0.0000e+00	-2.0312e-02	0.0000e+00	6.2125e+01
2.05	06-30-93	08:03:58	4.8975e+00	6.1080e+01	1.6326e+00	5.9892e+00	6.1018e+00	7.9185e+01	7.7004e+01	7.3738e-01	6.0312e-01	1.2347e-01	7.4613e+01
3.05	06-30-93	08:25:28	5.0048e+00	6.1761e+01	1.7001e+00	6.0327e+00	6.2208e+00	7.7927e+01	7.7628e+01	9.3693e-01	7.8219e-01	1.4978e-01	7.5275e+01
4.05	06-30-93	08:30:03	5.0252e+00	6.1802e+01	1.7055e+00	7.0076e+00	6.9968e+00	7.7837e+01	8.9672e+01	1.1969e+00	1.0031e+00	1.5904e-01	8.7050e+01
5.05	06-30-93	08:32:01	5.0026e+00	6.1690e+01	1.7020e+00	8.0161e+00	7.8557e+00	7.6436e+01	1.0171e+02	1.4529e+00	1.1959e+00	1.6206e-01	9.8525e+01
6.02 †	06-30-93	08:33:18	5.0156e+00	6.1753e+01	1.7024e+00	7.9924e+00	7.8214e+00	7.6847e+01	1.0167e+02	1.4461e+00	1.2008e+00	1.6254e-01	9.8500e+01
7.02 †	06-30-93	08:33:46	4.9958e+00	6.1670e+01	1.7027e+00	8.0171e+00	7.8640e+00	7.6414e+01	1.0178e+02	1.4587e+00	1.1953e+00	1.6174e-01	9.8438e+01
8.05	06-30-93	08:35:08	5.0003e+00	6.1620e+01	1.7032e+00	8.9949e+00	8.6151e+00	7.5490e+01	1.1312e+02	1.7048e+00	1.3941e+00	1.6237e-01	1.0954e+02
9.05	06-30-93	08:36:45	5.0195e+00	6.1689e+01	1.7010e+00	1.0020e+01	9.3441e+00	7.4937e+01	1.2457e+02	1.9511e+00	1.5816e+00	1.6037e-01	1.2054e+02
10.05	06-30-93	08:56:42	5.0274e+00	6.2013e+01	1.7992e+00	6.0190e+00	6.3084e+00	7.6267e+01	7.7220e+01	1.1458e+00	9.7031e-01	1.6052e-01	7.4762e+01
11.05	06-30-93	08:58:50	5.0201e+00	6.1919e+01	1.7991e+00	7.0087e+00	7.1389e+00	7.5639e+01	8.9242e+01	1.4632e+00	1.2359e+00	1.7143e-01	8.6463e+01
12.05	06-30-93	09:01:54	5.0037e+00	6.1789e+01	1.8012e+00	8.0092e+00	7.9523e+00	7.4512e+01	1.0105e+02	1.7679e+00	1.5059e+00	1.7473e-01	9.8000e+01
13.02 †	06-30-93	09:03:01	5.0325e+00	6.1918e+01	1.8008e+00	7.9714e+00	7.9470e+00	7.5217e+01	1.0126e+02	1.7939e+00	1.5172e+00	1.7917e-01	9.8000e+01
14.02 †	06-30-93	09:03:24	5.0085e+00	6.1847e+01	1.8027e+00	8.0000e+00	7.9817e+00	7.4629e+01	1.0131e+02	1.7925e+00	1.5141e+00	1.8380e-01	9.8000e+01
15.05	06-30-93	09:04:18	5.0173e+00	6.1840e+01	1.8015e+00	8.9766e+00	8.7767e+00	7.3773e+01	1.1303e+02	2.1099e+00	1.7881e+00	1.7974e-01	1.0925e+02
16.05	06-30-93	09:05:41	5.0150e+00	6.1714e+01	1.8014e+00	1.0054e+01	9.5229e+00	7.3335e+01	1.2402e+02	2.4382e+00	2.0544e+00	1.8203e-01	1.2000e+02
17.05	06-30-93	09:35:12	5.0212e+00	6.2081e+01	1.9020e+00	6.0283e+00	6.4198e+00	7.4782e+01	7.7204e+01	1.3485e+00	1.1500e+00	1.8554e-01	7.4562e+01
18.05	06-30-93	09:36:44	5.0122e+00	6.1964e+01	1.9004e+00	6.9869e+00	7.2383e+00	7.4222e+01	8.8733e+01	1.6992e+00	1.4566e+00	1.9373e-01	8.5887e+01
19.05	06-30-93	09:39:14	5.0145e+00	6.1982e+01	1.9002e+00	8.0513e+00	8.1326e+00	7.3300e+01	1.0136e+02	2.1204e+00	1.8134e+00	2.0433e-01	9.8037e+01
20.02 †	06-30-93	09:40:18	5.0241e+00	6.2054e+01	1.9023e+00	8.0502e+00	8.1280e+00	7.3560e+01	1.0138e+02	2.1198e+00	1.8242e+00	2.0125e-01	9.8062e+01
21.02 †	06-30-93	09:40:34	5.0198e+00	6.1937e+01	1.9023e+00	8.0195e+00	8.1300e+00	7.3435e+01	1.0154e+02	2.1409e+00	1.8188e+00	2.0224e-01	9.8062e+01
22.05	06-30-93	09:42:23	5.0111e+00	6.1928e+01	1.9029e+00	8.9878e+00	8.8784e+00	7.2666e+01	1.1202e+02	2.5502e+00	2.1450e+00	2.1375e-01	1.0831e+02
23.05	06-30-93	09:43:53	5.0065e+00	6.1799e+01	1.9014e+00	9.9709e+00	9.5938e+00	7.1852e+01	1.2224e+02	2.9017e+00	2.4678e+00	2.1514e-01	1.1845e+02
24.05	06-30-93	10:03:35	5.0139e+00	6.2157e+01	2.0039e+00	6.0305e+00	6.5193e+00	7.3052e+01	7.6835e+01	1.5250e+00	1.3025e+00	2.0193e-01	7.4125e+01
25.05	06-30-93	10:05:02	4.9992e+00	6.2023e+01	2.0014e+00	6.9986e+00	7.3470e+00	7.2671e+01	8.8306e+01	1.9216e+00	1.6566e+00	2.1566e-01	8.5375e+01
26.05 *	06-30-93	10:06:32	5.0252e+00	6.2083e+01	1.9997e+00	8.0362e+00	8.2068e+00	7.2129e+01	1.0052e+02	2.4099e+00	2.0750e+00	2.2324e-01	9.7312e+01
27.02 †	06-30-93	10:07:18	5.0043e+00	6.1979e+01	2.0034e+00	8.0436e+00	8.2180e+00	7.2061e+01	1.0074e+02	2.4000e+00	2.0687e+00	2.2473e-01	9.7281e+01
28.02 †	06-30-93	10:07:36	4.9944e+00	6.1935e+01	2.0017e+00	8.0711e+00	8.1969e+00	7.2212e+01	1.0042e+02	2.4042e+00	2.0719e+00	2.2230e-01	9.7281e+01
29.05	06-30-93	10:09:02	5.0207e+00	6.2079e+01	2.0021e+00	8.9530e+00	8.9843e+00	7.1209e+01	1.1124e+02	2.8759e+00	2.4528e+00	2.3526e-01	1.0743e+02
30.05	06-30-93	10:10:51	4.9998e+00	6.1865e+01	2.0030e+00	9.9690e+00	9.7640e+00	7.0925e+01	1.2224e+02	3.3431e+00	2.8600e+00	2.4069e-01	1.1790e+02
31.05	06-30-93	10:13:01	5.0173e+00	6.2053e+01	2.0047e+00	8.8945e+00	8.9282e+00	7.1252e+01	1.1034e+02	2.8453e+00	2.4319e+00	2.3308e-01	1.0670e+02
32.02 †	06-30-93	10:14:00	5.0410e+00	3.1084e+01	2.0137e+00	4.4258e+00	4.4573e+00	3.5803e+01	1.0895e+02	2.8605e+00	1.2148e+00	2.3348e-01	1.0669e+02
33.05	06-30-93	10:46:03	5.0365e+00	6.2317e+01	2.1015e+00	6.0486e+00	6.5942e+00	7.1958e+01	7.6468e+01	1.6986e+00	1.4588e+00	2.1201e-01	7.3988e+01
34.05	06-30-93	10:47:06	5.0020e+00	6.2097e+01	2.1033e+00	7.0202e+00	7.4414e+00	7.1291e+01	8.7928e+01	2.1550e+00	1.8525e+00	2.3099e-01	8.5050e+01
35.05	06-30-93	10:48:24	5.0308e+00	6.2232e+01	2.1020e+00	8.0443e+00	8.3430e+00	7.0745e+01	1.0035e+02	2.6927e+00	2.3253e+00	2.4070e-01	9.6938e+01
36.02 †	06-30-93	10:48:54	5.0170e+00	6.2159e+01	2.1014e+00	8.0405e+00	8.3448e+00	7.0998e+01	1.0052e+02	2.7186e+00	2.3219e+00	2.4290e-01	9.6938e+01
37.02 †	06-30-93	10:49:14	5.0099e+00	6.2078e+01	2.1021e+00	8.0605e+00	8.3181e+00	7.0691e+01	1.0008e+02	2.6735e+00	2.3195e+00	2.4053e-01	9.6938e+01
38.05	06-30-93	10:50:55	5.0241e+00	6.2145e+01	2.0997e+00	9.0259e+00	9.1289e+00	7.0193e+01	1.1127e+02	3.2004e+00	2.7622e+00	2.5221e-01	1.0753e+02
39.02 †	06-30-93	10:52:01	5.1130e+00	3.1005e+01	2.1135e+00	4.5382e+00	4.5639e+00	3.4837e+01	1.1010e+02	3.1827e+00	1.3703e+00	2.5945e-01	1.0753e+02
40.05	06-30-93	11:13:34	5.0320e+00	6.2305e+01	2.2017e+00	6.0259e+00	6.6321e+00	7.1110e+01	7.6194e+01	1.8378e+00	1.5972e+00	2.1028e-01	7.3762e+01
41.05	06-30-93	11:14:39	5.0009e+00	6.2094e+01	2.2041e+00	7.0043e+00	7.5102e+00	7.0682e+01	8.7843e+01	2.3393e+00	2.0425e+00	2.3381e-01	8.4975e+01
42.05	06-30-93	11:16:27	5.0122e+00	6.2189e+01	2.2045e+00	8.0289e+00	8.4303e+00	6.9938e+01	1.0003e+02	2.9488e+00	2.5563e+00	2.5892e-01	9.6562e+01
43.02 †	06-30-93	11:17:04	4.9972e+00	6.2115e+01	2.2046e+00	8.0403e+00	8.4649e+00	6.9290e+01	9.9958e+01	2.9622e+00	2.5508e+00	2.5527e-01	9.6562e+01
44.02 †	06-30-93	11:17:21	4.9958e+00	6.2065e+01	2.2034e+00	8.0450e+00	8.4313e+00	6.9656e+01	9.9937e+01	2.9692e+00	2.5461e+00	2.6371e-01	9.6562e+01
45.05	06-30-93	11:18:59	5.0043e+00	6.2136e+01	2.2044e+00	9.0592e+00	9.2723e+00	6.9016e+01	1.1113e+02	3.5600e+00	3.0791e+00	2.6415e-01	1.0751e+02
46.02 †	06-30-93	11:21:07	5.1879e+00	3.1154e+01	2.2148e+00	4.5141e+00	4.6475e+00	3.4550e+01	1.0954e+02	3.5944e+00	1.5383e+00	2.6092e-01	1.0747e+02
47.05	06-30-93	11:27:36	5.0122e+00	6.2171e+01	2.1987e+00	7.0003e+00	7.5296e+00	7.0636e+01	8.8098e+01	2.3617e+00	2.0447e+00	2.4383e-01	8.5125e+01
48.02 †	06-30-93	11:28:34	5.0241e+00	6.2235e+01	2.1967e+00	6.9997e+00	7.5357e+00	7.0563e+01	8.8232e+01	2.3585e+00	2.0445e+00	2.4379e-01	8.5125e+01
49.02 †	06-30-93	11:29:12	5.0904e+00	6.2709e+01	2.1978e+00	6.9777e+00	7.4750e+00	7.0753e+01	8.7936e+01	2.4033e+00	2.0727e+00	2.4028e-01	8.5125e+01
50.01	06-30-93	11:29:37	5.0693e+00	6.2646e+01	2.1990e+00	6.9898e+00	7.5402e+00	6.9721e+01	8.7842e+01	2.4071e+00	2.0687e+00	2.4603e-01	8.5062e+01
51.05	06-30-93	11:31:55	5.0082e+00	6.2254e+01	2.2027e+00	5.9793e+00	6.6308e+00	7.0767e+01	7.5788e+01	1.8156e+00	1.5672e+00	2.2192e-01	7.3125e+01
52.05	06-30-93	11:59:25	1.2484e+01	9.4760e+01	2.0917e+00	8.0067e+00	9.1741e+00	7.4800e+01	1.4375e+02	9.7294e+00	7.7297e+00	2.5036e-01	1.3843e+02

--- Summary Report --- Test Title: SPRE PC/TDAS Build 15
 File Name: 063093.dta, ChanFile: chspre05, Report Date: Tue Mar 15 15:19:35 1994

Rdg.Pt	Date	Time	pmean	Frequ	trtow	XP.a	XD.a	XD.p	vacld.r	pvpst	kwalt	etapvh	vsp
53.05	06-30-93	12:00:49	1.2485e+01	9.4973e+01	2.1000e+00	6.9801e+00	8.2967e+00	7.6594e+01	1.2560e+02	8.0937e+00	6.4237e+00	2.5093e-01	1.2119e+02
54.05	06-30-93	12:02:35	1.2501e+01	9.5209e+01	2.1035e+00	6.0152e+00	7.4777e+00	7.8151e+01	1.0848e+02	6.5687e+00	5.2025e+00	2.5030e-01	1.0456e+02
55.05	06-30-93	12:16:14	1.2501e+01	9.4447e+01	2.0068e+00	9.9335e+00	1.0686e+01	7.2633e+01	1.7834e+02	1.1554e+01	9.1003e+00	2.2618e-01	1.7200e+02
56.05	06-30-93	12:17:20	1.2500e+01	9.4551e+01	2.0007e+00	8.9193e+00	9.8324e+00	7.4630e+01	1.6237e+02	9.9897e+00	7.9600e+00	2.2902e-01	1.5644e+02
57.05*	06-30-93	12:18:35	1.2496e+01	9.4621e+01	2.0040e+00	8.0196e+00	8.9780e+00	7.6306e+01	1.4547e+02	8.5722e+00	6.9203e+00	2.2900e-01	1.4107e+02
58.05	06-30-93	12:19:44	1.2524e+01	9.4921e+01	2.0039e+00	6.9903e+00	8.1947e+00	7.7639e+01	1.2819e+02	7.1637e+00	5.7609e+00	2.3180e-01	1.2388e+02
59.05	06-30-93	12:20:46	1.2504e+01	9.5106e+01	2.0053e+00	5.9768e+00	7.3417e+00	7.9491e+01	1.0987e+02	5.7633e+00	4.6334e+00	2.3262e-01	1.0606e+02
60.05	06-30-93	12:31:51	1.2505e+01	9.4593e+01	1.8955e+00	7.9920e+00	8.9287e+00	7.7702e+01	1.4987e+02	7.2674e+00	5.9244e+00	2.0305e-01	1.4462e+02
61.01	06-30-93	15:03:31	1.1007e+01	0.0000e+00	1.7048e+00	0.0000e+00	0.0000e+00	0.0000e+00	1.1712e+02	7.2674e+00	-2.0312e-02	2.0305e-01	1.1356e+02

--- Summary Report --- Test Title: SPRE PC/TDAS Build 13
 FileName: 063093.dta, ChanFile: chspre05, Report Date: Mon Jul 25 11:50:42 1994

Rdg.Pt	Date	Time	Pmean	Freque	trtow	XP.a	vacld.r	falt.r	falt.p	rload	phasld	cap	pwacld
1.01	06-30-93	07:55:00	2.6059e+00	0.0000e+00	1.6493e+00	0.0000e+00	4.1905e-02	1.4262e-02	0.0000e+00	0.0000e+00	0.0000e+00	0.0000e+00	0.0000e+00
2.05	06-30-93	08:03:58	4.8975e+00	6.1080e+01	1.6326e+00	5.9892e+00	7.7004e+01	8.0014e+00	9.2054e+01	9.6243e+00	-1.2045e+00	7.8403e+02	6.1236e-01
3.05	06-30-93	08:25:28	5.0048e+00	6.1761e+01	1.7001e+00	6.0327e+00	7.7628e+01	1.0215e+01	9.1313e+01	7.5995e+00	-1.0577e+00	7.8211e+02	7.8868e-01
4.05	06-30-93	08:30:03	5.0252e+00	6.1802e+01	1.7055e+00	7.0076e+00	8.9672e+01	1.1166e+01	9.1496e+01	8.0314e+00	-1.0594e+00	7.8143e+02	9.9408e-01
5.05	06-30-93	08:32:01	5.0026e+00	6.1690e+01	1.7020e+00	8.0161e+00	1.0171e+02	1.1815e+01	9.1312e+01	8.6093e+00	-1.0473e+00	7.8372e+02	1.1993e+00
6.02	06-30-93	08:33:18	5.0156e+00	6.1753e+01	1.7024e+00	7.9924e+00	1.0167e+02	1.1858e+01	9.1545e+01	8.5739e+00	-1.0353e+00	7.8369e+02	1.1992e+00
7.02	06-30-93	08:33:46	4.9958e+00	6.1670e+01	1.7027e+00	8.0171e+00	1.0178e+02	1.1829e+01	9.1252e+01	8.6047e+00	-1.0618e+00	7.8417e+02	1.2013e+00
8.05	06-30-93	08:35:08	5.0003e+00	6.1620e+01	1.7032e+00	8.9949e+00	1.1312e+02	1.2362e+01	9.1236e+01	9.1514e+00	-1.0518e+00	7.8455e+02	1.3941e+00
9.05	06-30-93	08:36:45	5.0195e+00	6.1689e+01	1.7010e+00	1.0020e+01	1.2457e+02	1.2719e+01	9.1282e+01	9.7957e+00	-1.0581e+00	7.8449e+02	1.5760e+00
10.05	06-30-93	08:56:42	5.0274e+00	6.2013e+01	1.7992e+00	6.0190e+00	7.7220e+01	1.2643e+01	9.1085e+01	6.1080e+00	-9.9760e-01	7.8306e+02	9.7245e-01
11.05	06-30-93	08:58:50	5.0201e+00	6.1919e+01	1.7991e+00	7.0087e+00	8.9242e+01	1.3813e+01	9.1002e+01	6.4611e+00	-9.7394e-01	7.8194e+02	1.2261e+00
12.05	06-30-93	09:01:54	5.0037e+00	6.1789e+01	1.8012e+00	8.0092e+00	1.0105e+02	1.4817e+01	9.0846e+01	6.8205e+00	-9.8214e-01	7.8100e+02	1.4855e+00
13.02	06-30-93	09:03:01	5.0325e+00	6.1918e+01	1.8008e+00	7.9714e+00	1.0126e+02	1.4946e+01	9.1101e+01	6.7756e+00	-9.6225e-01	7.8591e+02	1.5048e+00
14.02	06-30-93	09:03:24	5.0085e+00	6.1847e+01	1.8027e+00	8.0000e+00	1.0131e+02	1.4954e+01	9.1203e+01	6.7750e+00	-9.6265e-01	7.8386e+02	1.5036e+00
15.05	06-30-93	09:04:18	5.0173e+00	6.1840e+01	1.8015e+00	8.9766e+00	1.1303e+02	1.5841e+01	9.0902e+01	7.1357e+00	-8.9961e-01	7.8650e+02	1.7751e+00
16.05	06-30-93	09:05:41	5.0150e+00	6.1714e+01	1.8014e+00	1.0054e+01	1.2402e+02	1.6470e+01	9.1097e+01	7.5311e+00	-9.1638e-01	7.8445e+02	2.0341e+00
17.05	06-30-93	09:35:12	5.0212e+00	6.2081e+01	1.9020e+00	6.0283e+00	7.7204e+01	1.4957e+01	9.1066e+01	5.1619e+00	-9.1472e-01	7.8625e+02	1.1512e+00
18.05	06-30-93	09:36:44	5.0122e+00	6.1964e+01	1.9004e+00	6.9869e+00	8.8733e+01	1.6376e+01	9.1019e+01	5.4189e+00	-8.8831e-01	7.8460e+02	1.4466e+00
19.05	06-30-93	09:39:14	5.0145e+00	6.1982e+01	1.9002e+00	8.0513e+00	1.0136e+02	1.7845e+01	9.0909e+01	5.6805e+00	-8.7408e-01	7.8410e+02	1.7999e+00
20.02	06-30-93	09:40:18	5.0241e+00	6.2054e+01	1.9023e+00	8.0502e+00	1.0138e+02	1.7968e+01	9.1262e+01	5.6423e+00	-8.6568e-01	7.8432e+02	1.8133e+00
21.02	06-30-93	09:40:34	5.0198e+00	6.1937e+01	1.9023e+00	8.0195e+00	1.0154e+02	1.7850e+01	9.0567e+01	5.6888e+00	-8.6430e-01	7.8871e+02	1.8053e+00
22.05	06-30-93	09:42:23	5.0111e+00	6.1928e+01	1.9029e+00	8.9878e+00	1.1202e+02	1.9058e+01	9.1168e+01	5.8784e+00	-8.4615e-01	7.8458e+02	2.1210e+00
23.05	06-30-93	09:43:53	5.0065e+00	6.1799e+01	1.9014e+00	9.9709e+00	1.2224e+02	1.9944e+01	9.0900e+01	6.1299e+00	-8.2412e-01	7.8181e+02	2.4187e+00
24.05	06-30-93	10:03:35	5.0139e+00	6.2157e+01	2.0039e+00	6.0305e+00	7.6835e+01	1.7036e+01	9.0752e+01	4.5102e+00	-8.2991e-01	7.8627e+02	1.3060e+00
25.05	06-30-93	10:05:02	4.9992e+00	6.2023e+01	2.0014e+00	6.9986e+00	8.8306e+01	1.8713e+01	9.1060e+01	4.7191e+00	-8.1601e-01	7.8409e+02	1.6454e+00
26.05	06-30-93	10:06:32	5.0252e+00	6.2083e+01	1.9997e+00	8.0362e+00	1.0052e+02	2.0432e+01	9.0746e+01	4.9175e+00	-8.0392e-01	7.8319e+02	2.0484e+00
27.02	06-30-93	10:07:18	5.0043e+00	6.1979e+01	2.0034e+00	8.0436e+00	1.0074e+02	2.0462e+01	9.0781e+01	4.9232e+00	-7.9569e-01	7.8501e+02	2.0519e+00
28.02	06-30-93	10:07:36	4.9944e+00	6.1935e+01	2.0017e+00	8.0711e+00	1.0042e+02	2.0418e+01	9.1421e+01	4.9188e+00	-7.9441e-01	7.8072e+02	2.0385e+00
29.05	06-30-93	10:09:02	5.0207e+00	6.2079e+01	2.0021e+00	8.9530e+00	1.1124e+02	2.1895e+01	9.0655e+01	5.0806e+00	-7.9911e-01	7.8463e+02	2.4247e+00
30.05	06-30-93	10:10:51	4.9998e+00	6.1865e+01	2.0030e+00	9.9690e+00	1.2224e+02	2.3359e+01	9.1212e+01	5.2344e+00	-9.3087e-01	7.8444e+02	2.8336e+00
31.05	06-30-93	10:13:01	5.0173e+00	6.2053e+01	2.0047e+00	8.8945e+00	1.1034e+02	2.1801e+01	9.0941e+01	5.0614e+00	-9.3951e-01	7.8093e+02	2.3948e+00
32.02	06-30-93	10:14:00	5.0410e+00	3.1084e+01	2.0137e+00	4.4258e+00	1.0895e+02	2.2365e+01	4.5435e+01	5.0487e+00	-9.8092e-01	7.8445e+02	2.4135e+00
33.05	06-30-93	10:46:03	5.0365e+00	6.2317e+01	2.1015e+00	6.0486e+00	7.6468e+01	1.8998e+01	9.0685e+01	4.0252e+00	-8.7471e-01	7.8209e+02	1.4513e+00
34.05	06-30-93	10:47:06	5.0020e+00	6.2097e+01	2.1033e+00	7.0202e+00	8.7928e+01	2.0882e+01	9.0762e+01	4.2108e+00	-8.3000e-01	7.8138e+02	1.8306e+00
35.05	06-30-93	10:48:24	5.0308e+00	6.2232e+01	2.1020e+00	8.0443e+00	1.0035e+02	2.2982e+01	9.0556e+01	4.3665e+00	-7.8495e-01	7.8360e+02	2.3010e+00
36.02	06-30-93	10:48:54	5.0170e+00	6.2159e+01	2.1014e+00	8.0405e+00	1.0052e+02	2.2994e+01	9.0816e+01	4.3717e+00	-7.6268e-01	7.8626e+02	2.3053e+00
37.02	06-30-93	10:49:14	5.0099e+00	6.2078e+01	2.1021e+00	8.0605e+00	1.0008e+02	2.2809e+01	9.0436e+01	4.3878e+00	-7.8027e-01	7.8125e+02	2.2755e+00
38.05	06-30-93	10:50:55	5.0241e+00	6.2145e+01	2.0997e+00	9.0259e+00	1.1127e+02	2.4597e+01	9.0726e+01	4.5238e+00	-7.4625e-01	7.8343e+02	2.7280e+00
39.02	06-30-93	10:52:01	5.1130e+00	3.1005e+01	2.1135e+00	4.5382e+00	1.1010e+02	2.5200e+01	4.5284e+01	4.5279e+00	-7.6849e-01	7.7777e+02	2.7048e+00
40.05	06-30-93	11:13:34	5.0320e+00	6.2305e+01	2.2017e+00	6.0259e+00	7.6194e+01	2.0687e+01	9.0577e+01	3.6833e+00	-8.0123e-01	7.8275e+02	1.5751e+00
41.05	06-30-93	11:14:39	5.0009e+00	6.2094e+01	2.2041e+00	7.0043e+00	8.7843e+01	2.2942e+01	9.0791e+01	3.8291e+00	-7.6444e-01	7.8337e+02	2.0107e+00
42.05	06-30-93	11:16:27	5.0122e+00	6.2189e+01	2.2045e+00	8.0289e+00	1.0003e+02	2.5370e+01	9.0760e+01	3.9430e+00	-7.1857e-01	7.8472e+02	2.5321e+00
43.02	06-30-93	11:17:04	4.9972e+00	6.2115e+01	2.2046e+00	8.0403e+00	9.9958e+01	2.5283e+01	9.0376e+01	3.9537e+00	-7.2594e-01	7.8270e+02	2.5194e+00
44.02	06-30-93	11:17:21	4.9958e+00	6.2065e+01	2.2034e+00	8.0450e+00	9.9937e+01	2.5185e+01	9.0563e+01	3.9682e+00	-7.1374e-01	7.8285e+02	2.5090e+00
45.05	06-30-93	11:18:59	5.0043e+00	6.2136e+01	2.2044e+00	9.0592e+00	1.1113e+02	2.7362e+01	9.0741e+01	4.0617e+00	-6.8351e-01	7.8166e+02	3.0300e+00
46.02	06-30-93	11:21:07	5.1879e+00	3.1154e+01	2.2148e+00	4.5141e+00	1.0954e+02	2.7776e+01	4.5279e+01	4.0396e+00	-6.8210e-01	7.8522e+02	3.0690e+00
47.05	06-30-93	11:27:36	5.0122e+00	6.2171e+01	2.1987e+00	7.0003e+00	8.8098e+01	2.3014e+01	9.0746e+01	3.8281e+00	-7.2956e-01	7.8607e+02	2.0234e+00
48.02	06-30-93	11:28:34	5.0241e+00	6.2235e+01	2.1967e+00	6.9997e+00	8.8232e+01	2.3079e+01	9.0463e+01	3.8231e+00	-7.2525e-01	7.8636e+02	2.0327e+00
49.02	06-30-93	11:29:12	5.0904e+00	6.2709e+01	2.1978e+00	6.9777e+00	8.7936e+01	2.3282e+01	9.0229e+01	3.7771e+00	-7.2253e-01	7.8054e+02	2.0377e+00
50.01	06-30-93	11:29:37	5.0693e+00	6.2646e+01	2.1990e+00	6.9898e+00	8.7842e+01	2.3302e+01	8.9518e+01	3.7699e+00	-7.2083e-01	7.7773e+02	2.0328e+00
51.05	06-30-93	11:31:55	5.0082e+00	6.2254e+01	2.2027e+00	5.9793e+00	7.5788e+01	2.0702e+01	9.0597e+01	3.6611e+00	-7.3458e-01	7.8601e+02	1.5665e+00
52.05	06-30-93	11:59:25	1.2484e+01	9.4760e+01	2.0917e+00	8.0067e+00	1.4375e+02	5.2729e+01	9.0889e+01	2.7261e+00	-2.0506e-01	3.4025e+02	7.5053e+00

--- Summary Report --- Test Title: SPRE PC/TDAS Build 13
 FileName: 063093.dta, ChanFile: chspre05, Report Date: Mon Jul 25 11:50:42 1994

Rdg.Pt	Date	Time	Pmean	Freque	trtow	XP.a	vacld.r	Ialt.r	Ialt.p	rload	phasld	cap	pwacld
53.05	06-30-93	12:00:49	1.2485e+01	9.4973e+01	2.1000e+00	6.9801e+00	1.2560e+02	4.9999e+01	9.0853e+01	2.5121e+00	-1.9038e-01	3.3951e+02	6.2356e+00
54.05	06-30-93	12:02:35	1.2501e+01	9.5209e+01	2.1035e+00	6.0152e+00	1.0848e+02	4.6891e+01	9.0371e+01	2.3136e+00	-1.9447e-01	3.3982e+02	5.0667e+00
55.05	06-30-93	12:16:14	1.2501e+01	9.4447e+01	2.0068e+00	9.9335e+00	1.7834e+02	5.0186e+01	9.1728e+01	3.5537e+00	-2.4420e-01	3.4093e+02	8.8200e+00
56.05	06-30-93	12:17:20	1.2500e+01	9.4551e+01	2.0007e+00	8.9193e+00	1.6237e+02	4.8245e+01	9.1442e+01	3.3655e+00	-2.4625e-01	3.4115e+02	7.7339e+00
57.05	06-30-93	12:18:35	1.2496e+01	9.4621e+01	2.0040e+00	8.0196e+00	1.4547e+02	4.6135e+01	9.1304e+01	3.1533e+00	-2.7059e-01	3.3730e+02	6.6378e+00
58.05	06-30-93	12:19:44	1.2524e+01	9.4921e+01	2.0039e+00	6.9903e+00	1.2819e+02	4.3906e+01	9.0395e+01	2.9196e+00	-2.8843e-01	3.3887e+02	5.5887e+00
59.05	06-30-93	12:20:46	1.2504e+01	9.5106e+01	2.0053e+00	5.9768e+00	1.0987e+02	4.1281e+01	9.0611e+01	2.6614e+00	-2.6012e-01	3.3938e+02	4.5118e+00
60.05	06-30-93	12:31:51	1.2505e+01	9.4593e+01	1.8955e+00	7.9920e+00	1.4987e+02	3.8946e+01	9.1077e+01	3.8482e+00	-3.7084e-01	3.4028e+02	5.7657e+00
61.01	06-30-93	15:03:31	1.1007e+01	0.0000e+00	1.7048e+00	0.0000e+00	1.1712e+02	2.0403e+01	0.0000e+00	3.8482e+00	-3.7084e-01	3.4028e+02	5.7657e+00

0-2

--- Summary Report --- Test Title: SPRE PC/TDAS Build 13
 FileName: 071393.dta, ChanFile: chspre05, Report Date: Tue Jul 13 13:01:41 1993

Rdg.Pt	Date	Time	pmean	Freque	trtow	XP.a	XD.a	XD.p	vacld.r	pvpst	kvalt	etapvh	vsp
1.05	07-13-93	08:00:50	5.0127e+00	6.1750e+01	1.6413e+00	5.7773e+00	5.9200e+00	7.9718e+01	7.4894e+01	7.4698e-01	6.1094e-01	1.4072e-01	7.2375e+01
2.05	07-13-93	08:21:29	4.9935e+00	6.1700e+01	1.7039e+00	6.0493e+00	6.1969e+00	7.8489e+01	7.7788e+01	9.5458e-01	7.8344e-01	1.4800e-01	7.5162e+01
3.05	07-13-93	08:23:41	5.0003e+00	6.1660e+01	1.7010e+00	7.9795e+00	7.7613e+00	7.7120e+01	1.0129e+02	1.4268e+00	1.1759e+00	1.6397e-01	9.7925e+01
4.05	07-13-93	08:26:17	5.0110e+00	6.1684e+01	1.7005e+00	8.7553e+00	8.3474e+00	7.6504e+01	1.1033e+02	1.6289e+00	1.3319e+00	1.6184e-01	1.0675e+02
5.05	07-13-93	08:34:03	5.0071e+00	6.1614e+01	1.6995e+00	1.0042e+01	9.3046e+00	7.5236e+01	1.2463e+02	1.9613e+00	1.5712e+00	1.5380e-01	1.2045e+02
6.05	07-13-93	08:35:50	5.0336e+00	6.1819e+01	1.7073e+00	8.7193e+00	8.2949e+00	7.6436e+01	1.0998e+02	1.6341e+00	1.3572e+00	1.6219e-01	1.0657e+02
7.05	07-13-93	08:38:04	5.0579e+00	6.1952e+01	1.7006e+00	8.6809e+00	8.3137e+00	7.6713e+01	1.1036e+02	1.6431e+00	1.3500e+00	1.6412e-01	1.0656e+02
8.02†	07-13-93	08:39:26	5.0141e+00	3.0853e+01	1.7055e+00	4.3701e+00	4.1843e+00	3.8203e+01	5.5151e+01	1.6715e+00	6.5937e-01	1.6392e-01	1.0656e+02
9.01	07-13-93	08:39:42	5.5576e+00	0.0000e+00	1.7123e+00	0.0000e+00	0.0000e+00	0.0000e+00	2.2237e-02	1.6715e+00	-2.0312e-02	1.6392e-01	1.0656e+02
10.05	07-13-93	09:14:01	5.0364e+00	6.2065e+01	1.8016e+00	5.9832e+00	6.2920e+00	7.6515e+01	7.7127e+01	1.1500e+00	9.6750e-01	1.5745e-01	7.4450e+01
11.05	07-13-93	09:16:33	5.0150e+00	6.1838e+01	1.8013e+00	7.9754e+00	7.9155e+00	7.5323e+01	1.0112e+02	1.7846e+00	1.5019e+00	1.8284e-01	9.7700e+01
12.05	07-13-93	09:18:43	5.0178e+00	6.1780e+01	1.7998e+00	1.0069e+01	9.5167e+00	7.3584e+01	1.2470e+02	2.4752e+00	2.0634e+00	1.8441e-01	1.2032e+02
13.05	07-13-93	09:21:46	5.0082e+00	6.1787e+01	1.8033e+00	8.7778e+00	8.5076e+00	7.4711e+01	1.1003e+02	2.0225e+00	1.7181e+00	1.8357e-01	1.0646e+02
14.02†	07-13-93	09:22:43	5.0325e+00	3.0998e+01	1.8084e+00	4.3655e+00	4.2620e+00	3.7537e+01	5.5283e+01	2.0866e+00	8.5625e-01	1.8307e-01	1.0647e+02
15.01	07-13-93	09:22:56	5.5717e+00	0.0000e+00	1.8193e+00	0.0000e+00	0.0000e+00	0.0000e+00	5.7167e-02	2.0866e+00	-1.8750e-02	1.8307e-01	1.0644e+02
16.05	07-13-93	09:45:46	5.0037e+00	6.2012e+01	1.9039e+00	6.0233e+00	6.3885e+00	7.4994e+01	7.6943e+01	1.3412e+00	1.1353e+00	1.8020e-01	7.4250e+01
17.05	07-13-93	09:47:47	5.0065e+00	6.1919e+01	1.9033e+00	8.0521e+00	8.0992e+00	7.3676e+01	1.0128e+02	2.1246e+00	1.8078e+00	2.0094e-01	9.7875e+01
18.05	07-13-93	09:49:14	5.0206e+00	6.1911e+01	1.9014e+00	1.0019e+01	9.6521e+00	7.2192e+01	1.2364e+02	2.9555e+00	2.4841e+00	2.1613e-01	1.1925e+02
19.05	07-13-93	09:52:37	5.0217e+00	6.1988e+01	1.9023e+00	8.8169e+00	8.7004e+00	7.3090e+01	1.1002e+02	2.4389e+00	2.0725e+00	2.0827e-01	1.0638e+02
20.02†	07-13-93	09:53:27	5.0353e+00	3.1046e+01	1.9080e+00	4.4043e+00	4.3664e+00	3.6297e+01	5.5099e+01	2.4576e+00	1.0305e+00	2.0887e-01	1.0631e+02
21.01	07-13-93	09:53:45	5.5717e+00	0.0000e+00	1.9191e+00	0.0000e+00	0.0000e+00	0.0000e+00	4.1905e-02	2.4576e+00	-1.8750e-02	2.0887e-01	1.0631e+02
22.05	07-13-93	10:32:15	5.0161e+00	6.2159e+01	2.0024e+00	6.0264e+00	6.5044e+00	7.3567e+01	7.6890e+01	1.5179e+00	1.3025e+00	2.0409e-01	7.4188e+01
23.05	07-13-93	10:33:41	5.0155e+00	6.2040e+01	1.9995e+00	7.9872e+00	8.1617e+00	7.2648e+01	1.0043e+02	2.3576e+00	2.0434e+00	2.2295e-01	9.6787e+01
24.05	07-13-93	10:35:57	5.0257e+00	6.2028e+01	2.0015e+00	9.9516e+00	9.7155e+00	7.0927e+01	1.2173e+02	3.3358e+00	2.8425e+00	2.3664e-01	1.1770e+02
25.05*	07-13-93	10:37:29	5.0161e+00	6.2037e+01	2.0019e+00	8.9419e+00	8.9152e+00	7.1678e+01	1.1066e+02	2.8384e+00	2.4297e+00	2.3133e-01	1.0705e+02
26.02†	07-13-93	10:38:33	5.0282e+00	3.1070e+01	2.0122e+00	4.4679e+00	4.4644e+00	3.5906e+01	5.5529e+01	2.8598e+00	1.2094e+00	2.3519e-01	1.0706e+02
27.01	07-13-93	10:38:50	5.5661e+00	0.0000e+00	2.0235e+00	0.0000e+00	0.0000e+00	0.0000e+00	4.0327e-02	2.8598e+00	-2.1875e-02	2.3519e-01	1.0700e+02
28.02†	07-13-93	10:42:52	5.0113e+00	6.2093e+01	2.0100e+00	8.8936e+00	8.9287e+00	7.0348e+01	1.0988e+02	2.8440e+00	2.4219e+00	2.3728e-01	1.0625e+02
29.05*	07-13-93	10:44:32	5.0455e+00	6.2387e+01	2.0112e+00	8.8829e+00	8.9820e+00	6.9597e+01	1.1014e+02	2.8848e+00	2.4369e+00	2.3180e-01	1.0630e+02
30.02†	07-13-93	10:46:33	4.9986e+00	6.2040e+01	2.0118e+00	8.8819e+00	8.9650e+00	7.0562e+01	1.1047e+02	2.8582e+00	2.4172e+00	2.3678e-01	1.0628e+02
31.02†	07-13-93	10:48:14	4.9887e+00	3.0936e+01	2.0172e+00	4.4415e+00	4.4379e+00	3.6135e+01	5.5261e+01	2.8074e+00	1.2039e+00	2.3198e-01	1.0631e+02
32.01	07-13-93	10:48:29	5.5774e+00	0.0000e+00	2.0301e+00	0.0000e+00	0.0000e+00	0.0000e+00	4.0036e-02	2.8074e+00	-2.1875e-02	2.3198e-01	6.7125e+01
33.05	07-13-93	11:11:28	5.0059e+00	6.2170e+01	2.1037e+00	6.0212e+00	6.5248e+00	7.2274e+01	7.5825e+01	1.6669e+00	1.4284e+00	2.1308e-01	7.3250e+01
34.05	07-13-93	11:12:50	5.0088e+00	6.2117e+01	2.0993e+00	8.0330e+00	8.2540e+00	7.1212e+01	9.9598e+01	2.6584e+00	2.2844e+00	2.4715e-01	9.6250e+01
35.05	07-13-93	11:15:04	5.0104e+00	6.2009e+01	2.1037e+00	1.0035e+01	9.8468e+00	6.9747e+01	1.2139e+02	3.7435e+00	3.2156e+00	2.5383e-01	1.1725e+02
36.05	07-13-93	11:18:26	5.0155e+00	6.2118e+01	2.1024e+00	8.9411e+00	9.0306e+00	7.0614e+01	1.1023e+02	3.1806e+00	2.7247e+00	2.5223e-01	1.0626e+02
37.02†	07-13-93	11:19:21	5.0268e+00	3.1004e+01	2.1075e+00	4.4781e+00	4.4697e+00	3.5742e+01	5.5029e+01	3.1553e+00	1.3461e+00	2.5253e-01	1.0631e+02
38.01	07-13-93	11:19:36	5.5294e+00	0.0000e+00	2.1193e+00	0.0000e+00	0.0000e+00	0.0000e+00	4.1905e-02	3.1553e+00	-1.8750e-02	2.5253e-01	1.0625e+02
39.02†	07-13-93	11:23:32	5.0325e+00	3.1106e+01	2.1106e+00	4.4696e+00	4.4900e+00	3.5260e+01	5.4901e+01	3.1663e+00	1.3516e+00	2.5354e-01	1.0616e+02
40.01	07-13-93	11:23:51	4.9195e+00	0.0000e+00	2.1214e+00	0.0000e+00	0.0000e+00	0.0000e+00	3.8058e-02	3.1663e+00	-1.8750e-02	2.5354e-01	6.6438e+01
41.01	07-13-93	11:25:41	4.8941e+00	6.1543e+01	2.1144e+00	5.2140e+00	5.6901e+00	7.2240e+01	6.5404e+01	1.2476e+00	1.0500e+00	1.8134e-01	6.2812e+01
42.05	07-13-93	11:54:58	1.2481e+01	9.4394e+01	1.8967e+00	9.9226e+00	1.0483e+01	7.2971e+01	1.8080e+02	9.5829e+00	7.5069e+00	1.9674e-01	1.7444e+02
43.05	07-13-93	11:58:19	1.2480e+01	9.4699e+01	1.9036e+00	8.0089e+00	8.9406e+00	7.6278e+01	1.4809e+02	7.3925e+00	5.9081e+00	2.0624e-01	1.4288e+02
44.05	07-13-93	12:01:28	1.2535e+01	9.5170e+01	1.9055e+00	5.9955e+00	7.2558e+00	8.0121e+01	1.1168e+02	5.0167e+00	4.0328e+00	2.0820e-01	1.0765e+02
45.05	07-13-93	12:08:02	1.2524e+01	9.4325e+01	1.8067e+00	1.0056e+01	1.0457e+01	7.4264e+01	1.8561e+02	8.0409e+00	6.2103e+00	1.6926e-01	1.7950e+02
46.05	07-13-93	12:19:11	1.2535e+01	9.4531e+01	1.7998e+00	8.0022e+00	8.7922e+00	7.8349e+01	1.5202e+02	5.9891e+00	4.8328e+00	1.7354e-01	1.4662e+02
47.05	07-13-93	12:27:26	1.2496e+01	9.4807e+01	1.8017e+00	6.0364e+00	7.1657e+00	8.1769e+01	1.1491e+02	4.1331e+00	3.3512e+00	1.7797e-01	1.1080e+02

--- Summary Report --- Test Title: SPRE PC/TDAS Build 13
 FileName: 071393.dta, ChanFile: chspre05, Report Date: Mon Jul 25 11:49:29 1994

Rdg.Pt	Date	Time	Pmean	Freque	trtow	XP.a	vacld.r	lalt.r	lalt.p	rload	phasld	cap	pwacld
1.05	07-13-93	08:00:50	5.0127e+00	6.1750e+01	1.6413e+00	5.7773e+00	7.4894e+01	8.3140e+00	9.1271e+01	9.0088e+00	-1.1562e+00	7.8587e+02	6.2142e-01
2.05	07-13-93	08:21:29	4.9935e+00	6.1700e+01	1.7039e+00	6.0493e+00	7.7788e+01	1.0210e+01	9.1383e+01	7.6189e+00	-1.0472e+00	7.8594e+02	7.9356e-01
3.05	07-13-93	08:23:41	5.0003e+00	6.1660e+01	1.7010e+00	7.9795e+00	1.0129e+02	1.1659e+01	9.1294e+01	8.6882e+00	-1.0463e+00	7.8559e+02	1.1786e+00
4.05	07-13-93	08:26:17	5.0110e+00	6.1684e+01	1.7005e+00	8.7553e+00	1.1033e+02	1.2096e+01	9.1265e+01	9.1226e+00	-1.0495e+00	7.8509e+02	1.3308e+00
5.05	07-13-93	08:34:03	5.0071e+00	6.1614e+01	1.6995e+00	1.0042e+01	1.2463e+02	1.2640e+01	9.1188e+01	9.8607e+00	-1.0322e+00	7.8549e+02	1.5665e+00
6.05	07-13-93	08:35:50	5.0336e+00	6.1819e+01	1.7073e+00	8.7193e+00	1.0998e+02	1.2324e+01	9.1160e+01	8.9245e+00	-1.0436e+00	7.8222e+02	1.3434e+00
7.05	07-13-93	08:38:04	5.0579e+00	6.1952e+01	1.7006e+00	8.6809e+00	1.1036e+02	1.2294e+01	9.1213e+01	8.9774e+00	-1.0302e+00	7.8713e+02	1.3477e+00
8.02	07-13-93	08:39:26	5.0141e+00	3.0853e+01	1.7055e+00	4.3701e+00	5.5151e+01	6.1328e+00	4.5661e+01	9.0024e+00	-1.0363e+00	7.8561e+02	1.3468e+00
9.01	07-13-93	08:39:42	5.5576e+00	0.0000e+00	1.7123e+00	0.0000e+00	2.2237e-02	9.7686e-03	0.0000e+00	9.0024e+00	-1.0363e+00	7.8561e+02	1.3468e+00
10.05	07-13-93	09:14:01	5.0364e+00	6.2065e+01	1.8016e+00	5.9832e+00	7.7127e+01	1.2694e+01	9.0821e+01	6.0760e+00	-9.4043e-01	7.8734e+02	9.7587e-01
11.05	07-13-93	09:16:33	5.0150e+00	6.1838e+01	1.8013e+00	7.9754e+00	1.0112e+02	1.4859e+01	9.1060e+01	6.8053e+00	-9.1508e-01	7.8604e+02	1.4918e+00
12.05	07-13-93	09:18:43	5.0178e+00	6.1780e+01	1.7998e+00	1.0069e+01	1.2470e+02	1.6515e+01	9.0803e+01	7.5512e+00	-8.8228e-01	7.8671e+02	2.0433e+00
13.05	07-13-93	09:21:46	5.0082e+00	6.1787e+01	1.8033e+00	8.7778e+00	1.1003e+02	1.5552e+01	9.1246e+01	7.0756e+00	-8.9713e-01	7.8370e+02	1.6961e+00
14.02	07-13-93	09:22:43	5.0325e+00	3.0998e+01	1.8084e+00	4.3655e+00	5.5283e+01	7.8484e+00	4.5615e+01	7.0478e+00	-8.7599e-01	7.8990e+02	1.7222e+00
15.01	07-13-93	09:22:56	5.5717e+00	0.0000e+00	1.8193e+00	0.0000e+00	5.7167e-02	1.2816e-02	0.0000e+00	7.0478e+00	-8.7599e-01	7.8990e+02	1.7222e+00
16.05	07-13-93	09:45:46	5.0037e+00	6.2012e+01	1.9039e+00	6.0233e+00	7.6943e+01	1.4853e+01	9.1213e+01	5.1806e+00	-8.6619e-01	7.8581e+02	1.1381e+00
17.05	07-13-93	09:47:47	5.0065e+00	6.1919e+01	1.9033e+00	8.0521e+00	1.0128e+02	1.7796e+01	9.1058e+01	5.6913e+00	-8.1789e-01	7.8481e+02	1.7922e+00
18.05	07-13-93	09:49:14	5.0206e+00	6.1911e+01	1.9014e+00	1.0019e+01	1.2364e+02	2.0050e+01	9.0952e+01	6.1671e+00	-7.8221e-01	7.8748e+02	2.4576e+00
19.05	07-13-93	09:52:37	5.0217e+00	6.1988e+01	1.9023e+00	8.8169e+00	1.1002e+02	1.8723e+01	9.0980e+01	5.8763e+00	-8.0513e-01	7.8410e+02	2.0484e+00
20.02	07-13-93	09:53:27	5.0353e+00	3.1046e+01	1.9080e+00	4.4043e+00	5.5099e+01	9.4150e+00	4.5176e+01	5.8553e+00	-7.9018e-01	7.8425e+02	2.0636e+00
21.01	07-13-93	09:53:45	5.5717e+00	0.0000e+00	1.9191e+00	0.0000e+00	4.1905e-02	1.3124e-02	0.0000e+00	5.8553e+00	-7.9018e-01	7.8425e+02	2.0636e+00
22.05	07-13-93	10:32:15	5.0161e+00	6.2159e+01	2.0024e+00	6.0264e+00	7.6890e+01	1.7008e+01	9.0805e+01	4.5210e+00	-8.0251e-01	7.8725e+02	1.3048e+00
23.05	07-13-93	10:33:41	5.0155e+00	6.2040e+01	1.9995e+00	7.9872e+00	1.0043e+02	2.0298e+01	9.0755e+01	4.9480e+00	-7.6828e-01	7.8728e+02	2.0313e+00
24.05	07-13-93	10:35:57	5.0257e+00	6.2028e+01	2.0015e+00	9.9516e+00	1.2173e+02	2.3144e+01	9.0685e+01	5.2599e+00	-7.0492e-01	7.8328e+02	2.8015e+00
25.05	07-13-93	10:37:29	5.0161e+00	6.2037e+01	2.0019e+00	8.9419e+00	1.1066e+02	2.1739e+01	9.0799e+01	5.0904e+00	-7.3891e-01	7.8235e+02	2.3947e+00
26.02	07-13-93	10:38:33	5.0282e+00	3.1070e+01	2.0122e+00	4.4679e+00	5.5529e+01	1.0966e+01	4.5494e+01	5.0657e+00	-7.3562e-01	7.8513e+02	2.4229e+00
27.01	07-13-93	10:38:50	5.5661e+00	0.0000e+00	2.0235e+00	0.0000e+00	4.0327e-02	1.2499e-02	0.0000e+00	5.0657e+00	-7.3562e-01	7.8513e+02	2.4229e+00
28.02	07-13-93	10:42:52	5.0113e+00	6.2093e+01	2.0100e+00	8.8936e+00	1.0988e+02	2.1864e+01	8.7652e+01	5.0260e+00	2.1095e+00	7.8265e+02	2.3886e+00
29.05	07-13-93	10:44:32	5.0455e+00	6.2387e+01	2.0112e+00	8.8829e+00	1.1014e+02	2.2128e+01	8.4925e+01	4.9781e+00	4.8379e+00	7.8581e+02	2.4248e+00
30.02	07-13-93	10:46:33	4.9986e+00	6.2040e+01	2.0118e+00	8.8819e+00	1.1047e+02	2.1964e+01	8.7737e+01	5.0301e+00	2.0901e+00	7.9057e+02	2.4130e+00
31.02	07-13-93	10:48:14	4.9887e+00	3.0936e+01	2.0172e+00	4.4415e+00	5.5261e+01	1.0964e+01	4.5570e+01	5.0414e+00	-6.7932e-01	7.9171e+02	2.4060e+00
32.01	07-13-93	10:48:29	5.5774e+00	0.0000e+00	2.0301e+00	0.0000e+00	4.0036e-02	1.4230e-02	0.0000e+00	5.0414e+00	-6.7932e-01	7.9171e+02	2.4060e+00
33.05	07-13-93	11:11:28	5.0059e+00	6.2170e+01	2.1037e+00	6.0212e+00	7.5825e+01	1.8781e+01	9.0734e+01	4.0373e+00	-7.2373e-01	7.8488e+02	1.4214e+00
34.05	07-13-93	11:12:50	5.0088e+00	6.2117e+01	2.0993e+00	8.0330e+00	9.9598e+01	2.2749e+01	9.0776e+01	4.3784e+00	-6.8583e-01	7.8413e+02	2.2590e+00
35.05	07-13-93	11:15:04	5.0104e+00	6.2009e+01	2.1037e+00	1.0035e+01	1.2139e+02	2.6215e+01	9.0547e+01	4.6309e+00	-6.4662e-01	7.8455e+02	3.1667e+00
36.05	07-13-93	11:18:26	5.0155e+00	6.2118e+01	2.1024e+00	8.9411e+00	1.1023e+02	2.4581e+01	9.0520e+01	4.4846e+00	-6.5666e-01	7.8744e+02	2.7006e+00
37.02	07-13-93	11:19:21	5.0268e+00	3.1004e+01	2.1075e+00	4.4781e+00	5.5029e+01	1.2157e+01	4.5467e+01	4.5276e+00	-6.5620e-01	7.8567e+02	2.6625e+00
38.01	07-13-93	11:19:36	5.5294e+00	0.0000e+00	2.1193e+00	0.0000e+00	4.1905e-02	1.3710e-02	0.0000e+00	4.5276e+00	-6.5620e-01	7.8567e+02	2.6625e+00
39.02	07-13-93	11:23:32	5.0325e+00	3.1106e+01	2.1106e+00	4.4696e+00	5.4901e+01	1.2259e+01	4.5165e+01	4.4789e+00	-6.4247e-01	7.8266e+02	2.6825e+00
40.01	07-13-93	11:23:51	4.9195e+00	0.0000e+00	2.1214e+00	0.0000e+00	3.8058e-02	1.4623e-02	0.0000e+00	4.4789e+00	-6.4247e-01	7.8266e+02	2.6825e+00
41.01	07-13-93	11:25:41	4.8941e+00	6.1543e+01	2.1144e+00	5.2140e+00	6.5404e+01	1.6268e+01	9.1905e+01	4.0204e+00	-7.8738e-01	7.8596e+02	1.0628e+00
42.05	07-13-93	11:54:58	1.2481e+01	9.4394e+01	1.8967e+00	9.9226e+00	1.8080e+02	4.0941e+01	8.9095e+01	4.4162e+00	-3.2342e-01	3.5219e+02	7.2811e+00
43.05	07-13-93	11:58:19	1.2480e+01	9.4699e+01	1.9036e+00	8.0089e+00	1.4809e+02	3.9325e+01	8.8455e+01	3.7659e+00	-3.3582e-01	3.5122e+02	5.7554e+00
44.05	07-13-93	12:01:28	1.2535e+01	9.5170e+01	1.9055e+00	5.9955e+00	1.1168e+02	3.5505e+01	8.7648e+01	3.1454e+00	-3.5118e-01	3.5199e+02	3.9480e+00
45.05	07-13-93	12:08:02	1.2524e+01	9.4325e+01	1.8067e+00	1.0056e+01	1.8561e+02	3.3000e+01	8.9241e+01	5.6258e+00	-4.3794e-01	3.5130e+02	6.0790e+00
46.05	07-13-93	12:19:11	1.2535e+01	9.4531e+01	1.7998e+00	8.0022e+00	1.5202e+02	3.1371e+01	8.8530e+01	4.8461e+00	-4.5217e-01	3.5308e+02	4.7086e+00
47.05	07-13-93	12:27:26	1.2496e+01	9.4807e+01	1.8017e+00	6.0364e+00	1.1491e+02	2.8870e+01	8.8285e+01	3.9803e+00	-4.7803e-01	3.5171e+02	3.2868e+00

Rdg.Pt	Date	Time	pmean	Freque	trtow	XP.a	XD.a	XD.p	vacld.r	pvpst	kwalr	etapvh	vsp
1.05	11-18-93	09:03:08	4.7568e+00	6.0274e+01	1.6559e+00	5.9790e+00	6.0306e+00	7.8661e+01	7.5275e+01	7.4049e-01	6.2656e-01	1.2769e-01	7.3262e+01
2.05	11-18-93	09:22:30	5.0367e+00	6.1978e+01	1.7001e+00	5.9612e+00	6.1362e+00	7.8624e+01	7.7226e+01	9.3646e-01	7.8125e-01	1.3913e-01	7.5062e+01
3.05	11-18-93	09:24:05	4.9864e+00	6.1596e+01	1.7012e+00	7.9823e+00	7.7319e+00	7.7017e+01	1.0108e+02	1.4619e+00	1.1919e+00	1.5991e-01	9.8338e+01
4.05	11-18-93	09:25:28	5.0333e+00	6.1808e+01	1.7033e+00	8.9683e+00	8.4626e+00	7.6333e+01	1.1293e+02	1.7273e+00	1.4134e+00	1.5693e-01	1.0994e+02
5.05	11-18-93	09:46:15	5.0050e+00	6.1917e+01	1.8037e+00	6.0148e+00	6.2556e+00	7.6607e+01	7.6880e+01	1.1430e+00	9.7437e-01	1.5584e-01	7.4863e+01
6.05	11-18-93	10:08:25	5.0271e+00	6.2137e+01	1.9060e+00	5.9783e+00	6.3314e+00	7.5029e+01	7.6228e+01	1.3389e+00	1.1403e+00	1.7289e-01	7.4113e+01
7.05	11-18-93	10:13:06	5.0231e+00	6.1989e+01	1.9044e+00	9.9868e+00	9.5980e+00	7.2306e+01	1.2290e+02	3.0109e+00	2.5134e+00	2.0856e-01	1.1938e+02
8.05	11-18-93	10:15:50	5.0327e+00	6.2057e+01	1.9074e+00	8.8279e+00	8.6938e+00	7.3296e+01	1.1022e+02	2.4734e+00	2.1256e+00	1.9749e-01	1.0710e+02
9.02	11-18-93	10:17:28	4.9982e+00	6.1793e+01	1.9119e+00	8.8142e+00	8.8013e+00	7.1983e+01	1.1069e+02	2.4662e+00	2.1234e+00	2.1184e-01	1.0709e+02
10.05	11-18-93	10:18:11	5.0305e+00	6.2209e+01	1.9006e+00	8.8176e+00	8.7897e+00	7.1101e+01	1.1030e+02	2.4996e+00	2.1041e+00	2.1305e-01	1.0719e+02
11.02	11-18-93	10:21:08	4.9714e+00	6.1887e+01	1.9082e+00	8.8565e+00	8.7929e+00	7.0779e+01	1.1007e+02	2.5034e+00	2.1000e+00	2.1209e-01	1.0713e+02
12.05	11-18-93	10:21:31	5.0344e+00	6.2268e+01	1.9103e+00	8.8119e+00	8.8169e+00	7.0936e+01	1.1032e+02	2.5550e+00	2.1319e+00	2.1643e-01	1.0713e+02
13.05	11-18-93	10:24:14	5.0033e+00	6.2041e+01	1.9021e+00	8.8232e+00	8.7791e+00	7.1177e+01	1.1019e+02	2.4851e+00	2.0922e+00	2.1060e-01	1.0716e+02
14.02	11-18-93	10:25:15	5.0095e+00	6.2103e+01	1.9033e+00	8.8351e+00	8.7993e+00	7.0730e+01	1.1009e+02	2.4411e+00	2.0969e+00	2.0075e-01	1.0713e+02
15.02	11-18-93	10:25:56	4.9996e+00	6.1904e+01	1.9053e+00	8.8621e+00	8.6982e+00	7.2082e+01	1.0969e+02	2.4915e+00	2.1031e+00	2.0368e-01	1.0716e+02
16.05	11-18-93	10:26:28	4.9869e+00	6.1793e+01	1.9074e+00	8.8593e+00	8.6932e+00	7.2877e+01	1.0997e+02	2.5060e+00	2.1097e+00	2.1037e-01	1.0713e+02
17.05	11-18-93	10:39:17	5.0208e+00	6.2210e+01	2.0074e+00	5.9906e+00	6.4247e+00	7.3531e+01	7.5909e+01	1.5228e+00	1.2925e+00	2.0211e-01	7.3863e+01
18.05*	11-18-93	10:41:38	5.0378e+00	6.2214e+01	2.0024e+00	8.0085e+00	8.1803e+00	7.2304e+01	1.0036e+02	2.4401e+00	2.0884e+00	2.3211e-01	9.7525e+01
19.05	11-18-93	10:43:56	5.0045e+00	6.1969e+01	1.9995e+00	1.0002e+01	9.7520e+00	7.0525e+01	1.2203e+02	3.3895e+00	2.8709e+00	2.3541e-01	1.1854e+02
20.05	11-18-93	10:45:30	5.0169e+00	6.2026e+01	2.0068e+00	8.8738e+00	8.8231e+00	7.1769e+01	1.0953e+02	2.8352e+00	2.4266e+00	2.2643e-01	1.0666e+02
21.02	11-18-93	10:47:24	5.0364e+00	6.2182e+01	2.0062e+00	8.8310e+00	8.8378e+00	7.1818e+01	1.0976e+02	2.8624e+00	2.4422e+00	2.3326e-01	1.0666e+02
22.02	11-18-93	10:47:45	5.0307e+00	6.2069e+01	2.0063e+00	8.8146e+00	8.8308e+00	7.2064e+01	1.0990e+02	2.8652e+00	2.4328e+00	2.2732e-01	1.0663e+02
23.02	11-18-93	10:48:12	5.0124e+00	3.1036e+01	2.0158e+00	4.4496e+00	4.4187e+00	3.5675e+01	5.4749e+01	2.8876e+00	1.2062e+00	2.3187e-01	1.0669e+02
24.01	11-18-93	10:48:24	4.9982e+00	0.0000e+00	2.0272e+00	0.0000e+00	0.0000e+00	0.0000e+00	5.1858e-02	2.8876e+00	-1.8750e-02	2.3187e-01	1.0669e+02
25.05	11-18-93	11:01:52	5.0220e+00	6.2069e+01	2.0036e+00	8.8763e+00	8.8279e+00	7.1827e+01	1.0992e+02	2.8687e+00	2.4231e+00	2.3318e-01	1.0694e+02
26.02	11-18-93	11:03:58	5.0124e+00	6.2085e+01	2.0066e+00	8.9013e+00	8.8993e+00	7.0432e+01	1.0977e+02	2.8491e+00	2.4281e+00	2.3578e-01	1.0688e+02
27.05	11-18-93	11:04:48	4.9937e+00	6.2062e+01	2.0066e+00	8.8901e+00	8.9492e+00	6.9590e+01	1.1004e+02	2.8667e+00	2.4128e+00	2.3349e-01	1.0691e+02
28.02	11-18-93	11:06:37	5.0237e+00	6.2263e+01	2.0079e+00	8.8750e+00	8.9512e+00	6.9506e+01	1.0997e+02	2.8721e+00	2.4320e+00	2.3129e-01	1.0691e+02
29.05	11-18-93	11:07:02	5.0141e+00	6.2179e+01	2.0073e+00	8.8753e+00	8.9470e+00	6.9555e+01	1.0998e+02	2.8630e+00	2.4288e+00	2.2941e-01	1.0686e+02
30.02	11-18-93	11:07:29	5.0067e+00	6.2137e+01	2.0079e+00	8.8770e+00	8.9586e+00	6.9480e+01	1.0997e+02	2.8596e+00	2.4219e+00	2.3540e-01	1.0691e+02
31.02	11-18-93	11:07:47	4.9968e+00	6.2032e+01	2.0075e+00	8.8985e+00	8.8590e+00	7.1046e+01	1.0986e+02	2.8300e+00	2.4281e+00	2.3529e-01	1.0694e+02
32.05	11-18-93	11:33:32	5.0022e+00	6.1932e+01	2.0020e+00	8.8845e+00	8.8131e+00	7.1940e+01	1.0989e+02	2.8338e+00	2.4106e+00	2.3393e-01	1.0693e+02
33.02	11-18-93	11:35:48	4.9968e+00	6.2060e+01	2.0014e+00	8.8826e+00	8.8853e+00	6.9831e+01	1.0979e+02	2.8094e+00	2.3852e+00	2.2974e-01	1.0691e+02
34.05	11-18-93	11:36:18	5.0350e+00	6.2482e+01	1.9981e+00	8.8145e+00	8.9902e+00	6.7818e+01	1.1018e+02	2.8303e+00	2.3894e+00	2.3405e-01	1.0693e+02
35.02	11-18-93	11:38:57	4.9912e+00	6.2191e+01	2.0021e+00	8.8702e+00	9.0079e+00	6.7544e+01	1.1011e+02	2.8394e+00	2.3773e+00	2.3864e-01	1.0691e+02
36.02	11-18-93	11:40:16	5.0251e+00	6.2455e+01	2.0056e+00	8.8710e+00	9.0279e+00	6.7389e+01	1.1002e+02	2.8400e+00	2.4062e+00	2.2673e-01	1.0694e+02
37.05	11-18-93	11:43:23	5.0310e+00	6.2473e+01	2.0106e+00	8.8651e+00	9.0102e+00	6.7462e+01	1.1001e+02	2.8655e+00	2.4253e+00	2.2965e-01	1.0693e+02
38.05	11-18-93	11:50:10	5.0367e+00	6.2434e+01	1.9992e+00	8.8495e+00	8.9938e+00	6.7891e+01	1.1008e+02	2.8099e+00	2.3925e+00	2.3548e-01	1.0693e+02
39.02	11-18-93	11:51:39	5.0081e+00	6.2275e+01	1.9996e+00	8.8585e+00	8.9990e+00	6.7822e+01	1.1005e+02	2.8020e+00	2.3773e+00	2.3000e-01	1.0694e+02
40.02	11-18-93	11:52:00	5.0039e+00	6.2214e+01	2.0016e+00	8.8688e+00	8.9675e+00	6.8050e+01	1.1001e+02	2.7654e+00	2.3766e+00	2.3397e-01	1.0691e+02
41.05	11-18-93	12:04:05	5.0220e+00	6.2310e+01	2.0079e+00	8.7605e+00	8.9058e+00	6.8679e+01	1.1017e+02	2.8170e+00	2.3766e+00	2.3468e-01	1.0693e+02
42.05	11-18-93	12:09:02	4.9909e+00	6.1974e+01	2.0141e+00	8.6151e+00	8.6961e+00	7.1068e+01	1.1041e+02	2.7203e+00	2.3334e+00	2.3397e-01	1.0693e+02
43.05	11-18-93	12:16:26	5.0457e+00	6.2531e+01	2.0030e+00	8.8280e+00	8.9918e+00	6.7836e+01	1.1014e+02	2.8451e+00	2.4116e+00	2.3495e-01	1.0694e+02
44.02	11-18-93	12:21:01	5.0194e+00	6.2212e+01	1.9977e+00	8.8752e+00	8.9152e+00	6.9776e+01	1.0992e+02	2.8102e+00	2.3930e+00	2.2973e-01	1.0691e+02
45.02	11-18-93	12:27:21	5.0237e+00	6.2220e+01	1.9933e+00	8.8719e+00	8.8915e+00	7.0017e+01	1.0979e+02	2.8320e+00	2.3781e+00	2.4513e-01	1.0691e+02
46.02	11-18-93	12:30:08	5.0364e+00	6.2323e+01	1.9907e+00	8.8308e+00	8.9232e+00	7.0014e+01	1.1015e+02	2.8004e+00	2.3859e+00	2.2749e-01	1.0688e+02
47.05	11-18-93	12:42:11	7.5003e+00	7.5116e+01	2.0074e+00	6.0106e+00	6.9180e+00	7.9305e+01	9.0130e+01	2.9179e+00	2.4634e+00	2.1945e-01	8.7387e+01
48.05	11-18-93	12:43:29	7.5201e+00	7.4979e+01	2.0174e+00	6.0463e+00	6.6242e+00	7.7040e+01	1.1905e+02	4.6206e+00	3.8800e+00	2.4352e-01	1.1551e+02
49.05	11-18-93	12:45:28	7.5077e+00	7.4742e+01	1.9986e+00	1.0053e+01	1.0154e+01	7.4723e+01	1.4524e+02	6.2270e+00	5.1656e+00	2.4594e-01	1.4111e+02
50.05	11-18-93	13:01:19	1.0007e+01	8.5859e+01	2.0021e+00	6.0116e+00	7.1766e+00	8.0150e+01	1.0081e+02	4.3755e+00	3.6009e+00	2.3310e-01	9.7750e+01
51.05	11-18-93	13:03:12	1.0043e+01	8.5633e+01	2.0012e+00	8.0161e+00	8.8288e+00	7.7888e+01	1.3368e+02	6.7330e+00	5.4778e+00	2.4019e-01	1.2956e+02
52.05	11-18-93	13:05:18	1.0010e+01	8.5298e+01	2.0064e+00	1.0026e+01	1.0431e+01	7.4135e+01	1.6230e+02	9.2093e+00	7.3766e+00	2.4275e-01	1.5770e+02

--- Summary Report --- Test Title: SPRE PC/TDAS Build 13
 FileName: 111893.dta, ChanFile: chspre05, Report Date: Thu Nov 18 15:03:48 1993

Rdg.Pt	Date	Time	pmean	Freque	trtow	XP.a	XD.a	XD.p	vacld.r	pypst	kwalt	etapvh	vsp
53.05	11-18-93	13:08:02	1.0024e+01	8.5436e+01	2.0093e+00	9.0032e+00	9.6409e+00	7.6198e+01	1.4861e+02	7.9973e+00	6.4653e+00	2.4245e-01	1.4388e+02
54.02	11-18-93	13:08:43	1.0028e+01	8.5492e+01	2.0075e+00	9.0208e+00	9.6313e+00	7.5884e+01	1.4838e+02	7.9901e+00	6.4469e+00	2.4504e-01	1.4388e+02
55.05	11-18-93	13:09:01	1.0039e+01	8.5588e+01	2.0057e+00	8.9998e+00	9.6696e+00	7.5626e+01	1.4847e+02	8.0162e+00	6.4513e+00	2.4383e-01	1.4388e+02
56.02	11-18-93	13:09:37	1.0021e+01	8.5449e+01	2.0075e+00	9.0582e+00	9.5799e+00	7.6173e+01	1.4796e+02	7.9761e+00	6.4320e+00	2.4351e-01	1.4388e+02
57.05	11-18-93	13:27:37	1.2485e+01	9.5193e+01	2.0064e+00	5.9961e+00	7.3841e+00	7.8275e+01	1.0944e+02	5.9463e+00	4.7006e+00	2.2848e-01	1.0610e+02
58.05*	11-18-93	13:29:22	1.2506e+01	9.4918e+01	1.9987e+00	7.9949e+00	9.0180e+00	7.5806e+01	1.4486e+02	8.8705e+00	6.9412e+00	2.3411e-01	1.4062e+02
59.05	11-18-93	13:31:08	1.2504e+01	9.4729e+01	1.9997e+00	8.9836e+00	9.8707e+00	7.3667e+01	1.6193e+02	1.0385e+01	8.0831e+00	2.3080e-01	1.5688e+02
60.02	11-18-93	13:31:55	1.2503e+01	9.4641e+01	2.0005e+00	8.9571e+00	9.8568e+00	7.3755e+01	1.6199e+02	1.0360e+01	8.0812e+00	2.3047e-01	1.5688e+02
61.02	11-18-93	13:32:24	1.2497e+01	9.4653e+01	2.0001e+00	9.0257e+00	9.7472e+00	7.4749e+01	1.6117e+02	1.0390e+01	8.0688e+00	2.2998e-01	1.5694e+02
62.05	11-18-93	13:33:45	1.2527e+01	9.4589e+01	2.0009e+00	1.0071e+01	1.0694e+01	7.1739e+01	1.7809e+02	1.1889e+01	9.2066e+00	2.2604e-01	1.7340e+02

Rdg.Pt	Date	Time	Pmean	Freque	trtow	XP.a	vacld.r	Ialt.r	Ialt.p	rload	phasld	cap	pwacld
1.05	11-18-93	09:03:08	4.7568e+00	6.0274e+01	1.6559e+00	5.9790e+00	7.5275e+01	8.4301e+00	9.2452e+01	8.9299e+00	-1.2735e+00	7.8468e+02	6.3393e-01
2.05	11-18-93	09:22:30	5.0367e+00	6.1978e+01	1.7001e+00	5.9612e+00	7.7226e+01	1.0208e+01	9.1170e+01	7.5656e+00	-1.1566e+00	7.8680e+02	7.8492e-01
3.05	11-18-93	09:24:05	4.9864e+00	6.1596e+01	1.7012e+00	7.9823e+00	1.0108e+02	1.1749e+01	9.1374e+01	8.6047e+00	-1.1417e+00	7.8485e+02	1.1849e+00
4.05	11-18-93	09:25:28	5.0333e+00	6.1808e+01	1.7033e+00	8.9683e+00	1.1293e+02	1.2463e+01	9.1089e+01	9.0632e+00	-1.1373e+00	7.8425e+02	1.3993e+00
5.05	11-18-93	09:46:15	5.0050e+00	6.1917e+01	1.8037e+00	6.0148e+00	7.6880e+01	1.2639e+01	9.1234e+01	6.0829e+00	-1.0689e+00	7.8234e+02	9.6637e-01
6.05	11-18-93	10:08:25	5.0271e+00	6.2137e+01	1.9060e+00	5.9783e+00	7.6228e+01	1.4876e+01	9.0935e+01	5.1243e+00	-9.8123e-01	7.8423e+02	1.1313e+00
7.05	11-18-93	10:13:06	5.0231e+00	6.1989e+01	1.9044e+00	9.9868e+00	1.2290e+02	2.0243e+01	9.0960e+01	6.0717e+00	-9.0934e-01	7.8503e+02	2.4697e+00
8.05	11-18-93	10:15:50	5.0327e+00	6.2057e+01	1.9074e+00	8.8279e+00	1.1022e+02	1.9026e+01	9.0915e+01	5.7931e+00	-9.7626e-01	7.8423e+02	2.0882e+00
9.02	11-18-93	10:17:28	4.9982e+00	6.1969e+01	1.9119e+00	8.8142e+00	1.1069e+02	1.9186e+01	8.7766e+01	5.7701e+00	2.2588e+00	7.9005e+02	2.1066e+00
10.05	11-18-93	10:18:11	5.0305e+00	6.2209e+01	1.9006e+00	8.8176e+00	1.1030e+02	1.9004e+01	8.4222e+01	5.8052e+00	5.5300e+00	7.8527e+02	2.0810e+00
11.02	11-18-93	10:21:08	4.9714e+00	6.1887e+01	1.9082e+00	8.8565e+00	1.1007e+02	1.8896e+01	8.4460e+01	5.8262e+00	5.5640e+00	7.8139e+02	2.0566e+00
12.05	11-18-93	10:21:31	5.0344e+00	6.2268e+01	1.9103e+00	8.8119e+00	1.1032e+02	1.9222e+01	8.4512e+01	5.7402e+00	5.3454e+00	7.8372e+02	2.1063e+00
13.05	11-18-93	10:24:14	5.0033e+00	6.2041e+01	1.9021e+00	8.8232e+00	1.1019e+02	1.8870e+01	8.4461e+01	5.8408e+00	5.5879e+00	7.8417e+02	2.0602e+00
14.02	11-18-93	10:25:15	5.0095e+00	6.2103e+01	1.9033e+00	8.8351e+00	1.1009e+02	1.8942e+01	8.4111e+01	5.8135e+00	5.5609e+00	7.8281e+02	2.0673e+00
15.02	11-18-93	10:25:56	4.9996e+00	6.1904e+01	1.9053e+00	8.8621e+00	1.0969e+02	1.8786e+01	8.7789e+01	5.8397e+00	2.3219e+00	7.7747e+02	2.0431e+00
16.05	11-18-93	10:26:28	4.9869e+00	6.1793e+01	1.9074e+00	8.8593e+00	1.0997e+02	1.8870e+01	9.1026e+01	5.8280e+00	-1.0170e+00	7.8017e+02	2.0579e+00
17.05	11-18-93	10:39:17	5.0208e+00	6.2210e+01	2.0074e+00	5.9906e+00	7.5909e+01	1.6876e+01	9.0734e+01	4.4982e+00	-9.3585e-01	7.8256e+02	1.2788e+00
18.05	11-18-93	10:41:38	5.0378e+00	6.2214e+01	2.0024e+00	8.0085e+00	1.0036e+02	2.0562e+01	9.0549e+01	4.8809e+00	-8.7163e-01	7.8474e+02	2.0590e+00
19.05	11-18-93	10:43:56	5.0045e+00	6.1969e+01	1.9995e+00	1.0002e+01	1.2203e+02	2.3149e+01	9.0452e+01	5.2722e+00	-9.3676e-01	7.8150e+02	2.8049e+00
20.05	11-18-93	10:45:30	5.0169e+00	6.2026e+01	2.0068e+00	8.8738e+00	1.0953e+02	2.1745e+01	9.0714e+01	5.0373e+00	-8.5809e-01	7.8177e+02	2.3720e+00
21.02	11-18-93	10:47:24	5.0364e+00	6.2182e+01	2.0062e+00	8.8310e+00	1.0976e+02	2.1909e+01	9.0533e+01	5.0103e+00	-8.7368e-01	7.8472e+02	2.3986e+00
22.02	11-18-93	10:47:45	5.0307e+00	6.2069e+01	2.0063e+00	8.8146e+00	1.0990e+02	2.1817e+01	9.0514e+01	5.0376e+00	-9.2115e-01	7.8757e+02	2.3910e+00
23.02	11-18-93	10:48:12	5.0124e+00	3.1036e+01	2.0158e+00	4.4496e+00	5.4749e+01	1.0928e+01	4.5447e+01	5.0128e+00	-8.6229e-01	7.7726e+02	2.3762e+00
24.01	11-18-93	10:48:24	4.9982e+00	0.0000e+00	2.0272e+00	0.0000e+00	5.1858e-02	4.2346e-02	0.0000e+00	5.0128e+00	-8.6229e-01	7.7726e+02	2.3762e+00
25.05	11-18-93	11:01:52	5.0220e+00	6.2069e+01	2.0036e+00	8.8763e+00	1.0992e+02	2.1673e+01	9.0904e+01	5.0718e+00	-9.2053e-01	7.8165e+02	2.3727e+00
26.02	11-18-93	11:03:58	5.0124e+00	6.2085e+01	2.0066e+00	8.9013e+00	1.0977e+02	2.1771e+01	8.7812e+01	5.0428e+00	1.9508e+00	7.7995e+02	2.3768e+00
27.05	11-18-93	11:04:48	4.9937e+00	6.2062e+01	2.0066e+00	8.8901e+00	1.1004e+02	2.1722e+01	8.5267e+01	5.0670e+00	4.6755e+00	7.8217e+02	2.3729e+00
28.02	11-18-93	11:06:37	5.0237e+00	6.2263e+01	2.0079e+00	8.8750e+00	1.0997e+02	2.1880e+01	8.5121e+01	5.0270e+00	4.6976e+00	7.8224e+02	2.3920e+00
29.05	11-18-93	11:07:02	5.0141e+00	6.2179e+01	2.0073e+00	8.8753e+00	1.0998e+02	2.1833e+01	8.4964e+01	5.0384e+00	4.6832e+00	7.8335e+02	2.3871e+00
30.02	11-18-93	11:07:29	5.0067e+00	6.2137e+01	2.0079e+00	8.8770e+00	1.0997e+02	2.1822e+01	8.4949e+01	5.0406e+00	4.6976e+00	7.8321e+02	2.3835e+00
31.02	11-18-93	11:07:47	4.9968e+00	6.2032e+01	2.0075e+00	8.8985e+00	1.0986e+02	2.1734e+01	8.8366e+01	5.0555e+00	1.9884e+00	7.8156e+02	2.3725e+00
32.05	11-18-93	11:33:32	5.0022e+00	6.1932e+01	2.0020e+00	8.8845e+00	1.0989e+02	2.1550e+01	9.0992e+01	5.0998e+00	-8.9403e-01	7.8258e+02	2.3551e+00
33.02	11-18-93	11:35:48	4.9968e+00	6.2060e+01	2.0014e+00	8.8826e+00	1.0979e+02	2.1629e+01	8.4751e+01	5.0778e+00	5.3857e+00	7.8168e+02	2.3401e+00
34.05	11-18-93	11:36:18	5.0350e+00	6.2482e+01	1.9981e+00	8.8145e+00	1.1018e+02	2.2007e+01	7.8593e+01	5.0105e+00	1.1290e+01	7.8782e+02	2.3650e+00
35.02	11-18-93	11:38:57	4.9912e+00	6.2191e+01	2.0021e+00	8.8702e+00	1.1011e+02	2.1888e+01	7.8599e+01	5.0343e+00	1.1698e+01	7.8140e+02	2.3531e+00
36.02	11-18-93	11:40:16	5.0251e+00	6.2455e+01	2.0056e+00	8.8710e+00	1.1002e+02	2.2116e+01	7.8596e+01	4.9782e+00	1.1291e+01	7.8487e+02	2.3824e+00
37.05	11-18-93	11:43:23	5.0310e+00	6.2473e+01	2.0106e+00	8.8651e+00	1.1001e+02	2.2204e+01	7.8626e+01	4.9571e+00	1.1346e+01	7.8162e+02	2.3874e+00
38.05	11-18-93	11:50:10	5.0367e+00	6.2434e+01	1.9992e+00	8.8495e+00	1.1008e+02	2.1923e+01	7.8578e+01	5.0235e+00	1.1265e+01	7.8396e+02	2.3638e+00
39.02	11-18-93	11:51:39	5.0081e+00	6.2275e+01	1.9996e+00	8.8585e+00	1.1005e+02	2.1867e+01	7.8613e+01	5.0350e+00	1.1328e+01	7.8533e+02	2.3560e+00
40.02	11-18-93	11:52:00	5.0039e+00	6.2214e+01	2.0016e+00	8.8688e+00	1.1001e+02	2.1825e+01	7.8719e+01	5.0431e+00	1.1580e+01	7.8275e+02	2.3473e+00
41.05	11-18-93	12:04:05	5.0220e+00	6.2310e+01	2.0079e+00	8.7605e+00	1.1017e+02	2.1820e+01	8.1337e+01	5.0524e+00	1.1554e+01	7.2513e+02	2.3507e+00
42.05	11-18-93	12:09:02	4.9909e+00	6.1974e+01	2.0141e+00	8.6151e+00	1.1041e+02	2.1612e+01	8.8350e+01	5.1233e+00	1.2417e+01	6.1008e+02	2.3080e+00
43.05	11-18-93	12:16:26	5.0457e+00	6.2531e+01	2.0030e+00	8.8280e+00	1.1014e+02	2.2126e+01	7.8683e+01	4.9800e+00	1.1220e+01	7.8407e+02	2.3784e+00
44.02	11-18-93	12:21:01	5.0194e+00	6.2212e+01	1.9977e+00	8.8752e+00	1.0992e+02	2.1698e+01	8.4826e+01	5.0673e+00	5.2365e+00	7.8225e+02	2.3542e+00
45.02	11-18-93	12:27:21	5.0237e+00	6.2220e+01	1.9933e+00	8.8719e+00	1.0979e+02	2.1517e+01	8.4474e+01	5.1043e+00	5.3179e+00	7.8069e+02	2.3317e+00
46.02	11-18-93	12:30:08	5.0364e+00	6.2323e+01	1.9907e+00	8.8308e+00	1.1015e+02	2.1630e+01	8.4627e+01	5.0938e+00	5.1894e+00	7.8443e+02	2.3543e+00
47.05	11-18-93	12:42:11	7.5003e+00	7.5116e+01	2.0074e+00	6.0106e+00	9.0130e+01	2.6985e+01	9.1927e+01	3.3400e+00	-6.0008e-01	5.2983e+02	2.4316e+00
48.05	11-18-93	12:43:29	7.5201e+00	7.4979e+01	2.0174e+00	8.0463e+00	1.1905e+02	3.2025e+01	9.1812e+01	3.7174e+00	-5.9114e-01	5.2947e+02	3.8095e+00
49.05	11-18-93	12:45:28	7.5077e+00	7.4742e+01	1.9986e+00	1.0053e+01	1.4524e+02	3.4868e+01	9.1845e+01	4.1657e+00	-6.0149e-01	5.2862e+02	5.0509e+00
50.05	11-18-93	13:01:19	1.0007e+01	8.5859e+01	2.0021e+00	6.0116e+00	1.0081e+02	3.5016e+01	9.1595e+01	2.8791e+00	-4.1572e-01	4.0839e+02	3.5202e+00
51.05	11-18-93	13:03:12	1.0043e+01	8.5633e+01	2.0012e+00	8.0161e+00	1.3368e+02	4.0134e+01	9.2078e+01	3.3310e+00	-4.5927e-01	4.1006e+02	5.3406e+00
52.05	11-18-93	13:05:18	1.0010e+01	8.5298e+01	2.0064e+00	1.0026e+01	1.6230e+02	4.4407e+01	9.2364e+01	3.6549e+00	-3.8838e-01	4.0807e+02	7.1368e+00

--- Summary Report --- Test Title: SPRE PC/TDAS Build 13
 FileName: 111893.dta, ChanFile: chspre05, Report Date: Mon Jul 25 11:45:51 1994

Rdg.Pt	Date	Time	Pmean	Freque	trtow	XP.a	vacld.r	Ialt.r	Ialt.p	rload	phasld	cap	pwacld
53.05	11-18-93	13:08:02	1.0024e+01	8.5436e+01	2.0093e+00	9.0032e+00	1.4861e+02	4.2767e+01	9.2305e+01	3.4749e+00	-4.0070e-01	4.1120e+02	6.3114e+00
54.02	11-18-93	13:08:43	1.0028e+01	8.5492e+01	2.0075e+00	9.0208e+00	1.4838e+02	4.2623e+01	9.1914e+01	3.4813e+00	-3.9838e-01	4.0930e+02	6.2813e+00
55.05	11-18-93	13:09:01	1.0039e+01	8.5588e+01	2.0057e+00	8.9998e+00	1.4847e+02	4.2739e+01	9.1906e+01	3.4739e+00	-3.7945e-01	4.1040e+02	6.3073e+00
56.02	11-18-93	13:09:37	1.0021e+01	8.5449e+01	2.0075e+00	9.0582e+00	1.4796e+02	4.2359e+01	9.2398e+01	3.4931e+00	-4.0532e-01	4.0690e+02	6.2233e+00
57.05	11-18-93	13:27:37	1.2485e+01	9.5193e+01	2.0064e+00	5.9961e+00	1.0944e+02	4.1899e+01	8.7035e+01	2.6121e+00	-2.8220e-01	3.5083e+02	4.5666e+00
58.05	11-18-93	13:29:22	1.2506e+01	9.4918e+01	1.9987e+00	7.9949e+00	1.4486e+02	4.6745e+01	8.8441e+01	3.0990e+00	-3.1430e-01	3.4971e+02	6.7191e+00
59.05	11-18-93	13:31:08	1.2504e+01	9.4729e+01	1.9997e+00	8.9336e+00	1.6193e+02	4.8912e+01	8.8281e+01	3.3108e+00	-2.9888e-01	3.5083e+02	7.8371e+00
60.02	11-18-93	13:31:55	1.2503e+01	9.4641e+01	2.0005e+00	8.9571e+00	1.6199e+02	4.8823e+01	8.7986e+01	3.3180e+00	-3.0442e-01	3.5190e+02	7.8215e+00
61.02	11-18-93	13:32:24	1.2497e+01	9.4653e+01	2.0001e+00	9.0257e+00	1.6117e+02	4.8586e+01	8.9330e+01	3.3172e+00	-2.8160e-01	3.4799e+02	7.7438e+00
62.05	11-18-93	13:33:45	1.2527e+01	9.4589e+01	2.0009e+00	1.0071e+01	1.7809e+02	5.0177e+01	8.8610e+01	3.5493e+00	-3.1182e-01	3.4831e+02	8.8283e+00

Rdg.Pt	Date	Time	pmean	Freque	trtow	XP.a	XD.a	XD.p	vacld.r	pvpst	kvalt	etapvh	vsp
1.05	12-17-93	08:43:44	5.0103e+00	6.1808e+01	1.7002e+00	6.1276e+00	6.2303e+00	7.8926e+01	7.9409e+01	8.5609e-01	7.1000e-01	1.2481e-01	7.7500e-01
2.05	12-17-93	09:24:01	5.0154e+00	6.2098e+01	1.9025e+00	6.0483e+00	6.3374e+00	7.5507e+01	7.7644e+01	1.2210e+00	1.0250e+00	1.5664e-01	7.5662e+01
3.05	12-17-93	09:25:57	5.0154e+00	6.1983e+01	1.9004e+00	8.0042e+00	7.9674e+00	7.4353e+01	1.0121e+02	1.9297e+00	1.6228e+00	1.8155e-01	9.8700e-01
4.05	12-17-93	09:27:53	5.0307e+00	6.2052e+01	1.9025e+00	8.7975e+00	8.6172e+00	7.3412e+01	1.1045e+02	2.2764e+00	1.8903e+00	1.8713e-01	1.0774e+02
5.02 +	12-17-93	09:28:50	5.0097e+00	6.1971e+01	1.9014e+00	8.8407e+00	8.5973e+00	7.3462e+01	1.1018e+02	2.2460e+00	1.8867e+00	1.8114e-01	1.0769e+02
6.05	12-17-93	09:29:18	5.0001e+00	6.1901e+01	1.9035e+00	8.8161e+00	8.6377e+00	7.3147e+01	1.1045e+02	2.2380e+00	1.8887e+00	1.8001e-01	1.0769e+02
7.02 +	12-17-93	09:30:09	5.0677e+00	6.2217e+01	1.9073e+00	8.7947e+00	8.5957e+00	7.3534e+01	1.1015e+02	2.2695e+00	1.9195e+00	1.8030e-01	1.0769e+02
8.02 +	12-17-93	09:30:31	5.0493e+00	6.2229e+01	1.9037e+00	8.7850e+00	8.6578e+00	7.2808e+01	1.1047e+02	2.2398e+00	1.9047e+00	1.7663e-01	1.0772e+02
9.05	12-17-93	09:30:54	5.0437e+00	6.2178e+01	1.9039e+00	8.7891e+00	8.6468e+00	7.2705e+01	1.1036e+02	2.2497e+00	1.9062e+00	1.7886e-01	1.0772e+02
10.02 +	12-17-93	09:32:08	5.0196e+00	6.2047e+01	1.9048e+00	8.8068e+00	8.6433e+00	7.3153e+01	1.1063e+02	2.2416e+00	1.8969e+00	1.8177e-01	1.0772e+02
11.05	12-17-93	09:34:39	5.0533e+00	6.2102e+01	1.9001e+00	1.0016e+01	9.5373e+00	7.2597e+01	1.2399e+02	2.7275e+00	2.2909e+00	1.8196e-01	1.2088e+02
12.05	12-17-93	09:55:30	5.0228e+00	6.2208e+01	2.0088e+00	5.9905e+00	6.3519e+00	7.4202e+01	7.6477e+01	1.3451e+00	1.1541e+00	1.5993e-01	7.4600e+01
13.05 *	12-17-93	09:56:51	5.0369e+00	6.2194e+01	2.0074e+00	7.2816e+00	8.0816e+00	7.2958e+01	1.0067e+02	2.2508e+00	1.9041e+00	1.9458e-01	9.8113e+01
14.05	12-17-93	09:58:51	4.9990e+00	6.1974e+01	2.0068e+00	8.8828e+00	8.7373e+00	7.1965e+01	1.0992e+02	2.5652e+00	2.1888e+00	1.9793e-01	1.0751e+02
15.02 +	12-17-93	09:59:22	4.9970e+00	6.1889e+01	2.0073e+00	8.8725e+00	8.6914e+00	7.2546e+01	1.0983e+02	2.5631e+00	2.1859e+00	1.9822e-01	1.0756e+02
16.05	12-17-93	10:02:04	5.0454e+00	6.2245e+01	2.0057e+00	8.8323e+00	8.7374e+00	7.2389e+01	1.1029e+02	2.6040e+00	2.2034e+00	1.9904e-01	1.0751e+02
17.02 +	12-17-93	10:03:54	4.9928e+00	6.1907e+01	2.0057e+00	8.8153e+00	8.7729e+00	7.2356e+01	1.1072e+02	2.5695e+00	2.1797e+00	1.9759e-01	1.0753e+02
18.02 +	12-17-93	10:06:37	5.0536e+00	6.2354e+01	2.0072e+00	8.8663e+00	8.8322e+00	7.1471e+01	1.1077e+02	2.6319e+00	2.2242e+00	1.9864e-01	1.0797e+02
19.05	12-17-93	10:07:13	5.0329e+00	6.2190e+01	2.0067e+00	8.8723e+00	8.8154e+00	7.1451e+01	1.1077e+02	2.6116e+00	2.2084e+00	2.0245e-01	1.0799e+02
20.02 +	12-17-93	10:08:08	5.0112e+00	6.2059e+01	2.0061e+00	8.8845e+00	8.7936e+00	7.1851e+01	1.1069e+02	2.6224e+00	2.2016e+00	2.0396e-01	1.0797e+02
21.05	12-17-93	10:09:25	5.0103e+00	6.1982e+01	2.0027e+00	9.9823e+00	9.5817e+00	7.1671e+01	1.2254e+02	3.0648e+00	2.5944e+00	2.0305e-01	1.1945e+02
22.02 +	12-17-93	10:11:17	5.0310e+00	6.2109e+01	2.0004e+00	9.9719e+00	9.6291e+00	7.1156e+01	1.2266e+02	3.0974e+00	2.6008e+00	2.0206e-01	1.1944e+02
23.02 +	12-17-93	10:12:03	5.0168e+00	6.2003e+01	2.0018e+00	9.9601e+00	9.6239e+00	7.1219e+01	1.2268e+02	3.0281e+00	2.5961e+00	1.9967e-01	1.1950e+02
24.05	12-17-93	10:13:23	5.0233e+00	6.1970e+01	2.0012e+00	9.9861e+00	9.5603e+00	7.2623e+01	1.2259e+02	3.0588e+00	2.6100e+00	2.0008e-01	1.1947e+02
25.05	12-17-93	10:14:57	5.0465e+00	6.2140e+01	2.0031e+00	8.8452e+00	8.7119e+00	7.3350e+01	1.1022e+02	2.5919e+00	2.1959e+00	1.9731e-01	1.0750e+02
26.02 +	12-17-93	10:15:54	5.0239e+00	6.2070e+01	2.0057e+00	8.8297e+00	8.7293e+00	7.3239e+01	1.1051e+02	2.5772e+00	2.1906e+00	1.9662e-01	1.0747e+02
27.05	12-17-93	10:16:28	5.0103e+00	6.2013e+01	2.0056e+00	8.8304e+00	8.7222e+00	7.2599e+01	1.1022e+02	2.5493e+00	2.1706e+00	1.9634e-01	1.0749e+02
28.05	12-17-93	10:18:24	5.0194e+00	6.2006e+01	2.0067e+00	8.8280e+00	8.7380e+00	7.3210e+01	1.1045e+02	2.5625e+00	2.1819e+00	1.9444e-01	1.0751e+02
29.05	12-17-93	10:20:52	5.0278e+00	6.1894e+01	2.0075e+00	8.9873e+00	8.7243e+00	7.5537e+01	1.1043e+02	2.6160e+00	2.2309e+00	1.9715e-01	1.0751e+02
30.02 +	12-17-93	10:22:30	5.0380e+00	6.1891e+01	2.0084e+00	9.0131e+00	8.7741e+00	7.5681e+01	1.1051e+02	2.6417e+00	2.2766e+00	2.0293e-01	1.0750e+02
31.05	12-17-93	10:22:58	5.0165e+00	6.1741e+01	2.0072e+00	9.1579e+00	8.8280e+00	7.5861e+01	1.1022e+02	2.7334e+00	2.3166e+00	2.0505e-01	1.0749e+02
32.02 +	12-17-93	10:24:57	5.0083e+00	6.1710e+01	2.0045e+00	9.1147e+00	8.7510e+00	7.5630e+01	1.1003e+02	2.6277e+00	2.2914e+00	2.0053e-01	1.0750e+02
33.02 +	12-17-93	10:27:23	5.0267e+00	6.1887e+01	2.0042e+00	9.0754e+00	8.8083e+00	7.5611e+01	1.1050e+02	2.6918e+00	2.2898e+00	2.0468e-01	1.0747e+02
34.02 +	12-17-93	10:28:38	5.0423e+00	6.1905e+01	2.0020e+00	9.0471e+00	8.7252e+00	7.5975e+01	1.1041e+02	2.6299e+00	2.3000e+00	1.9875e-01	1.0753e+02
35.02 +	12-17-93	10:28:52	5.0211e+00	6.1804e+01	2.0031e+00	9.0800e+00	8.7684e+00	7.5889e+01	1.1044e+02	2.7253e+00	2.2961e+00	2.0572e-01	1.0747e+02
36.05	12-17-93	10:29:52	5.0013e+00	6.1646e+01	2.0032e+00	9.1738e+00	8.8220e+00	7.5872e+01	1.1016e+02	2.6827e+00	2.3078e+00	2.0275e-01	1.0750e+02
37.05	12-17-93	10:31:31	5.0081e+00	6.1786e+01	2.0030e+00	8.9512e+00	8.7340e+00	7.4677e+01	1.1026e+02	2.6188e+00	2.2503e+00	2.0351e-01	1.0749e+02
38.05	12-17-93	10:32:53	5.0239e+00	6.1965e+01	2.0026e+00	8.9164e+00	8.6999e+00	7.4035e+01	1.1002e+02	2.6393e+00	2.2356e+00	2.0326e-01	1.0746e+02
39.05	12-17-93	10:34:25	4.9922e+00	6.1873e+01	2.0035e+00	8.8734e+00	8.7321e+00	7.3047e+01	1.1026e+02	2.5721e+00	2.2094e+00	2.0054e-01	1.0744e+02
40.05	12-17-93	10:35:35	5.0397e+00	6.2186e+01	2.0027e+00	8.8150e+00	8.7531e+00	7.2572e+01	1.1042e+02	2.6152e+00	2.2200e+00	2.0193e-01	1.0749e+02
41.05	12-17-93	10:36:42	5.0131e+00	6.2043e+01	2.0031e+00	8.8607e+00	8.7386e+00	7.2287e+01	1.1008e+02	2.5985e+00	2.2081e+00	2.0425e-01	1.0747e+02
42.05	12-17-93	10:38:21	5.0409e+00	6.2170e+01	2.0022e+00	9.1936e+00	9.0100e+00	7.2013e+01	1.1406e+02	2.7753e+00	2.3547e+00	2.0857e-01	1.1136e+02
43.05	12-17-93	10:55:54	7.5222e+00	7.5219e+01	2.0127e+00	6.0377e+00	6.8781e+00	7.8965e+01	9.1267e+01	2.7502e+00	2.3241e+00	2.0572e-01	8.8875e+01
44.05	12-17-93	10:58:57	7.5363e+00	7.5082e+01	2.0010e+00	8.0080e+00	8.4720e+00	7.7131e+01	1.1930e+02	4.1717e+00	3.4975e+00	2.1745e-01	1.1624e+02
45.05	12-17-93	11:01:00	7.5244e+00	7.4949e+01	1.9991e+00	9.0108e+00	9.2542e+00	7.5902e+01	1.3285e+02	4.1097e+00	4.1097e+00	2.1624e-01	1.2949e+02
46.02 +	12-17-93	11:01:30	7.5012e+00	7.4896e+01	1.9995e+00	9.0308e+00	9.2841e+00	7.5719e+01	1.3306e+02	4.9363e+00	4.1078e+00	2.1467e-01	1.2947e+02
47.02 +	12-17-93	11:04:07	7.5620e+00	7.5153e+01	2.0032e+00	9.0083e+00	9.2646e+00	7.5797e+01	1.3294e+02	4.9787e+00	4.1422e+00	2.1601e-01	1.2950e+02
48.10	12-17-93	11:06:01	7.5100e+00	7.4775e+01	2.0037e+00	1.0069e+01	1.0053e+01	7.4480e+01	1.4602e+02	5.7242e+00	4.7694e+00	2.1555e-01	1.4236e+02
49.05	12-17-93	11:19:17	1.0030e+01	8.6046e+01	2.0034e+00	5.9952e+00	7.1073e+00	8.0177e+01	1.0202e+02	3.9865e+00	3.2716e+00	2.0147e-01	9.9175e+01
50.05	12-17-93	11:22:57	1.0002e+01	8.5502e+01	2.0022e+00	7.9834e+00	8.7067e+00	7.7789e+01	1.3469e+02	5.9349e+00	4.8947e+00	2.0445e-01	1.3105e+02
51.05	12-17-93	11:24:59	1.0000e+01	8.5383e+01	2.0022e+00	8.9551e+00	9.5379e+00	7.6080e+01	1.5036e+02	7.0643e+00	5.7694e+00	2.0881e-01	1.4590e+02
52.02 +	12-17-93	11:25:29	9.9899e+00	8.5329e+01	2.0033e+00	8.9428e+00	9.5335e+00	7.6454e+01	1.5069e+02	7.0629e+00	5.7375e+00	2.0911e-01	1.4591e+02

--- Summary Report --- Test Title: SPRE PC/TDAS Build 13
 FileName: 121793.dta, ChanFile: chspre05, Report Date: Fri Mar 18 14:20:45 1994

Rdg.Pt	Date	Time	pmean	Freque	trtow	XP.a	XD.a	XD.p	vacld.r	pvpst	kvalt	etapvh	vap
53.02 †	12-17-93	11:25:50	9.9659e+00	8.5284e+01	2.0038e+00	9.0006e+00	9.5186e+00	7.5763e+01	1.4974e+02	7.0850e+00	5.7547e+00	2.0939e-01	1.4588e+02
54.05	12-17-93	11:26:55	1.0012e+01	8.5294e+01	2.0013e+00	9.9903e+00	1.0293e+01	7.4098e+01	1.6433e+02	8.1378e+00	6.5944e+00	2.0655e-01	1.6025e+02
55.05	12-17-93	11:39:05	1.2532e+01	9.5206e+01	2.0021e+00	6.0473e+00	7.2663e+00	8.0048e+01	1.1158e+02	5.5512e+00	4.4409e+00	2.0829e-01	1.0856e+02
56.05 *	12-17-93	11:41:18	1.2507e+01	9.4744e+01	2.0029e+00	8.0228e+00	8.8805e+00	7.6856e+01	1.4682e+02	8.2406e+00	6.5597e+00	2.1466e-01	1.4294e+02
57.05	12-17-93	11:43:34	1.2505e+01	9.4573e+01	2.0030e+00	8.9795e+00	9.7165e+00	7.5314e+01	1.6430e+02	9.6334e+00	7.6347e+00	2.1236e-01	1.5950e+02
58.02 †	12-17-93	11:43:58	1.2488e+01	9.4533e+01	2.0028e+00	9.0183e+00	9.6803e+00	7.5464e+01	1.6388e+02	9.7146e+00	7.6242e+00	2.1267e-01	1.5947e+02
59.02 †	12-17-93	11:44:15	1.2487e+01	9.4500e+01	2.0021e+00	9.0107e+00	9.6576e+00	7.5801e+01	1.6407e+02	9.6160e+00	7.6094e+00	2.1114e-01	1.5950e+02
60.05	12-17-93	11:45:29	1.2507e+01	9.4452e+01	2.0000e+00	9.9883e+00	1.0438e+01	7.3366e+01	1.7902e+02	1.0868e+01	8.5441e+00	2.0700e-01	1.7469e+02
61.05	12-17-93	12:04:22	1.5035e+01	1.0341e+02	2.0071e+00	6.0573e+00	7.5331e+00	7.8905e+01	1.1925e+02	7.1084e+00	5.4603e+00	2.0565e-01	1.1599e+02
62.05	12-17-93	12:05:55	1.5087e+01	1.0314e+02	1.9983e+00	8.0345e+00	9.2492e+00	7.5305e+01	1.5771e+02	1.0475e+01	7.9287e+00	2.0721e-01	1.5345e+02
63.05	12-17-93	12:08:29	1.5074e+01	1.0293e+02	1.9992e+00	9.0454e+00	1.0151e+01	7.3081e+01	1.7652e+02	1.2267e+01	9.2041e+00	2.0593e-01	1.7156e+02
64.05	12-17-93	12:09:59	1.5036e+01	1.0272e+02	1.9909e+00	1.0036e+01	1.0919e+01	7.0965e+01	1.9295e+02	1.3498e+01	1.0023e+01	1.9800e-01	1.8819e+02
65.05	12-17-93	12:14:21	1.5054e+01	1.0285e+02	2.0027e+00	9.4230e+00	1.0428e+01	7.2339e+01	1.8245e+02	1.2693e+01	9.5463e+00	2.0033e-01	1.7768e+02
66.05	12-17-93	12:16:13	1.5040e+01	1.0275e+02	2.0016e+00	1.0019e+01	1.0965e+01	7.1109e+01	1.9335e+02	1.3664e+01	1.0138e+01	1.9842e-01	1.8800e+02
67.02 †	12-17-93	12:29:04	1.5092e+01	1.0301e+02	1.9975e+00	8.9593e+00	9.9962e+00	7.3138e+01	1.7384e+02	1.1775e+01	8.8477e+00	2.0248e-01	1.6975e+02
67.02 †	12-17-93	12:29:04	1.5092e+01	1.0301e+02	1.9975e+00	8.9593e+00	9.9962e+00	7.3138e+01	1.7384e+02	1.1775e+01	8.8477e+00	2.0248e-01	1.6975e+02

--- Summary Report --- Test Title: SPRE PC/TDAS Build 13
 FileName: 121793.dta, ChanFile: chspre05, Report Date: Mon Jul 25 11:48:14 1994

Rdg.Pt	Date	Time	Pmean	Freque	trtow	XP.a	vacld.r	Ialt.r	Ialt.p	rload	phasld	cap	pwacld
1.05	12-17-93	08:43:44	5.0103e+00	6.1808e+01	1.7002e+00	6.1276e+00	7.9409e+01	9.0875e+00	9.1350e+01	8.7387e+00	-1.1349e+00	6.9140e+02	7.1606e-01
2.05	12-17-93	09:24:01	5.0154e+00	6.2098e+01	1.9025e+00	6.0483e+00	7.7644e+01	1.3250e+01	9.1041e+01	5.8599e+00	-9.3951e-01	7.3393e+02	1.0256e+00
3.05	12-17-93	09:25:57	5.0154e+00	6.1983e+01	1.9004e+00	8.0042e+00	1.0121e+02	1.5941e+01	9.0997e+01	6.3493e+00	-9.0286e-01	7.3486e+02	1.6055e+00
4.05	12-17-93	09:27:53	5.0307e+00	6.2052e+01	1.9025e+00	8.7975e+00	1.1045e+02	1.6979e+01	9.0692e+01	6.5058e+00	-8.9054e-01	7.3549e+02	1.8661e+00
5.02	12-17-93	09:28:50	5.0097e+00	6.1971e+01	1.9014e+00	8.8407e+00	1.1018e+02	1.6910e+01	9.1241e+01	6.5159e+00	-9.1130e-01	7.3104e+02	1.8509e+00
6.05	12-17-93	09:29:18	5.0001e+00	6.1901e+01	1.9035e+00	8.8161e+00	1.1045e+02	1.6965e+01	9.0783e+01	6.5106e+00	-8.9902e-01	7.3468e+02	1.8609e+00
7.02	12-17-93	09:30:09	5.0677e+00	6.2217e+01	1.9073e+00	8.7947e+00	1.1015e+02	1.7141e+01	9.0538e+01	6.4264e+00	-8.9589e-01	7.3239e+02	1.8827e+00
8.02	12-17-93	09:30:31	5.0493e+00	6.2229e+01	1.9037e+00	8.7850e+00	1.1047e+02	1.7150e+01	8.8908e+01	6.4424e+00	6.9170e-01	7.3596e+02	1.8886e+00
9.05	12-17-93	09:30:54	5.0437e+00	6.2178e+01	1.9039e+00	8.7891e+00	1.1036e+02	1.7117e+01	8.7612e+01	6.4488e+00	2.1712e+00	7.3604e+02	1.8821e+00
10.02	12-17-93	09:32:08	5.0196e+00	6.2047e+01	1.9048e+00	8.8068e+00	1.1063e+02	1.7112e+01	8.9746e+01	6.4656e+00	6.1021e-01	7.3739e+02	1.8823e+00
11.05	12-17-93	09:34:39	5.0533e+00	6.2102e+01	1.9001e+00	1.0016e+01	1.2399e+02	1.8298e+01	9.0512e+01	6.7774e+00	-8.6861e-01	7.3660e+02	2.2563e+00
12.05	12-17-93	09:55:30	5.0228e+00	6.2208e+01	2.0088e+00	5.9905e+00	7.6477e+01	1.5054e+01	9.0853e+01	5.0801e+00	-8.8291e-01	7.3622e+02	1.1492e+00
13.05	12-17-93	09:56:51	5.0369e+00	6.2194e+01	2.0074e+00	7.9816e+00	1.0067e+02	1.8748e+01	9.0585e+01	5.3699e+00	-8.2470e-01	7.3769e+02	1.8829e+00
14.05	12-17-93	09:58:51	4.9990e+00	6.1974e+01	2.0068e+00	8.8828e+00	1.0992e+02	1.9613e+01	9.0854e+01	5.6048e+00	-8.1957e-01	7.3142e+02	2.1430e+00
15.02	12-17-93	09:59:22	4.9970e+00	6.1889e+01	2.0073e+00	8.8725e+00	1.0983e+02	1.9515e+01	9.1094e+01	5.6285e+00	-8.2016e-01	7.3220e+02	2.1300e+00
16.05	12-17-93	10:02:04	5.0454e+00	6.2245e+01	2.0057e+00	8.8323e+00	1.1029e+02	1.9763e+01	9.0587e+01	5.5810e+00	-8.2556e-01	7.3571e+02	2.1734e+00
17.02	12-17-93	10:03:54	4.9928e+00	6.1907e+01	2.0057e+00	8.8153e+00	1.1072e+02	1.9624e+01	9.0774e+01	5.6425e+00	-8.2111e-01	7.4285e+02	2.1592e+00
18.02	12-17-93	10:06:37	5.0536e+00	6.2354e+01	2.0072e+00	8.8663e+00	1.1077e+02	1.9908e+01	8.9007e+01	5.5645e+00	5.0444e-01	7.3626e+02	2.1995e+00
19.05	12-17-93	10:07:13	5.0329e+00	6.2190e+01	2.0067e+00	8.8723e+00	1.1077e+02	1.9753e+01	8.7928e+01	5.6083e+00	1.7956e+00	7.3773e+02	2.1813e+00
20.02	12-17-93	10:08:08	5.0112e+00	6.2059e+01	2.0061e+00	8.8845e+00	1.1069e+02	1.9664e+01	8.9367e+01	5.6297e+00	4.6994e-01	7.3650e+02	2.1661e+00
21.05	12-17-93	10:09:25	5.0103e+00	6.1982e+01	2.0027e+00	9.9823e+00	1.2254e+02	2.0937e+01	9.0916e+01	5.8535e+00	-7.9426e-01	7.3679e+02	2.5478e+00
22.02	12-17-93	10:11:17	5.0310e+00	6.2109e+01	2.0004e+00	9.9719e+00	1.2266e+02	2.1008e+01	8.9386e+01	5.8397e+00	4.6921e-01	7.3749e+02	2.5636e+00
23.02	12-17-93	10:12:03	5.0168e+00	6.2003e+01	2.0018e+00	9.9601e+00	1.2268e+02	2.0934e+01	8.9305e+01	5.8612e+00	4.6276e-01	7.3856e+02	2.5505e+00
24.05	12-17-93	10:13:23	5.0233e+00	6.1970e+01	2.0012e+00	9.9861e+00	1.2259e+02	2.1063e+01	9.4078e+01	5.8203e+00	-7.9096e-01	6.7042e+02	2.5635e+00
25.05	12-17-93	10:14:57	5.0465e+00	6.2140e+01	2.0031e+00	8.8452e+00	1.1022e+02	1.9678e+01	9.3749e+01	5.6014e+00	-8.0182e-01	6.9103e+02	2.1617e+00
26.02	12-17-93	10:15:54	5.0239e+00	6.2070e+01	2.0057e+00	8.8797e+00	1.1051e+02	1.9723e+01	9.2823e+01	5.6039e+00	5.0980e-01	6.9424e+02	2.1696e+00
27.05	12-17-93	10:16:28	5.0103e+00	6.2013e+01	2.0056e+00	8.8304e+00	1.1022e+02	1.9492e+01	9.1357e+01	5.6556e+00	1.7838e+00	6.9122e+02	2.1371e+00
28.05	12-17-93	10:18:24	5.0194e+00	6.2006e+01	2.0067e+00	8.8280e+00	1.1045e+02	1.9653e+01	9.3874e+01	5.6205e+00	1.7364e+00	6.4787e+02	2.1587e+00
29.05	12-17-93	10:20:52	5.0278e+00	6.1894e+01	2.0075e+00	8.9873e+00	1.1043e+02	2.0052e+01	1.0100e+02	5.5079e+00	1.6794e+00	5.5309e+02	2.1980e+00
30.02	12-17-93	10:22:30	5.0380e+00	6.1891e+01	2.0084e+00	9.0131e+00	1.1051e+02	2.0407e+01	1.0172e+02	5.4167e+00	4.4473e-01	5.5402e+02	2.2399e+00
31.05	12-17-93	10:22:58	5.0165e+00	6.1741e+01	2.0072e+00	9.1579e+00	1.1022e+02	2.0736e+01	1.0355e+02	5.3157e+00	-7.6387e-01	5.5086e+02	2.2808e+00
32.02	12-17-93	10:24:57	5.0083e+00	6.1710e+01	2.0045e+00	9.1147e+00	1.1003e+02	2.0446e+01	1.0241e+02	5.3824e+00	4.7206e-01	5.4877e+02	2.2381e+00
33.02	12-17-93	10:27:23	5.0267e+00	6.1887e+01	2.0042e+00	9.0754e+00	1.1050e+02	2.0645e+01	1.0209e+02	5.3530e+00	4.4174e-01	5.5160e+02	2.2728e+00
34.02	12-17-93	10:28:38	5.0423e+00	6.1905e+01	2.0020e+00	9.0471e+00	1.1041e+02	2.0538e+01	1.0220e+02	5.3764e+00	4.8108e-01	5.5154e+02	2.2536e+00
35.02	12-17-93	10:28:52	5.0211e+00	6.1804e+01	2.0031e+00	9.0800e+00	1.1044e+02	2.0578e+01	1.0244e+02	5.3675e+00	4.4651e-01	5.5174e+02	2.2612e+00
36.05	12-17-93	10:29:52	5.0013e+00	6.1646e+01	2.0032e+00	9.1738e+00	1.1016e+02	2.0615e+01	1.0359e+02	5.3442e+00	-7.6392e-01	5.4945e+02	2.2658e+00
37.05	12-17-93	10:31:31	5.0081e+00	6.1786e+01	2.0030e+00	8.9512e+00	1.1026e+02	2.0148e+01	9.8633e+01	5.4728e+00	-7.8878e-01	6.1127e+02	2.2060e+00
38.05	12-17-93	10:32:53	5.0239e+00	6.1965e+01	2.0026e+00	8.9164e+00	1.1002e+02	2.0014e+01	9.6434e+01	5.4975e+00	-7.9907e-01	6.4643e+02	2.1886e+00
39.05	12-17-93	10:34:25	4.9922e+00	6.1873e+01	2.0035e+00	8.8734e+00	1.1026e+02	1.9866e+01	9.3789e+01	5.5506e+00	-8.0399e-01	6.9583e+02	2.1734e+00
40.05	12-17-93	10:35:35	5.0397e+00	6.2186e+01	2.0027e+00	8.8150e+00	1.1042e+02	1.9951e+01	9.1149e+01	5.5348e+00	-8.0834e-01	7.4560e+02	2.1956e+00
41.05	12-17-93	10:36:42	5.0131e+00	6.2043e+01	2.0031e+00	8.8607e+00	1.1008e+02	1.9801e+01	9.0844e+01	5.5596e+00	-8.1206e-01	7.5431e+02	2.1697e+00
42.05	12-17-93	10:38:21	5.0409e+00	6.2170e+01	2.0022e+00	9.1936e+00	1.1406e+02	2.0321e+01	9.0446e+01	5.6133e+00	-8.0122e-01	7.5502e+02	2.3097e+00
43.05	12-17-93	10:55:54	7.5222e+00	7.5219e+01	2.0127e+00	6.0377e+00	9.1267e+01	2.5107e+01	9.0519e+01	3.6351e+00	-5.7937e-01	5.1636e+02	2.2843e+00
44.05	12-17-93	10:58:57	7.5363e+00	7.5082e+01	2.0010e+00	8.0080e+00	1.1930e+02	2.8828e+01	9.0689e+01	4.1384e+00	-5.7408e-01	5.3039e+02	3.4369e+00
45.05	12-17-93	11:01:00	7.5244e+00	7.4949e+01	1.9991e+00	9.0108e+00	1.3285e+02	3.0401e+01	9.0802e+01	4.3702e+00	-5.4886e-01	5.3610e+02	4.0339e+00
46.02	12-17-93	11:01:30	7.5012e+00	7.4896e+01	1.9995e+00	9.0308e+00	1.3306e+02	3.0469e+01	9.0884e+01	4.3671e+00	-5.6579e-01	5.3625e+02	4.0473e+00
47.02	12-17-93	11:04:07	7.5620e+00	7.5153e+01	2.0032e+00	9.0083e+00	1.3294e+02	3.0666e+01	9.0542e+01	4.3353e+00	-5.5641e-01	5.3592e+02	4.0735e+00
48.10	12-17-93	11:06:01	7.5100e+00	7.4775e+01	2.0037e+00	1.0069e+01	1.4602e+02	3.2060e+01	9.0904e+01	4.5549e+00	-5.4408e-01	5.3537e+02	4.6679e+00
49.05	12-17-93	11:19:17	1.0030e+01	8.6046e+01	2.0034e+00	5.9952e+00	1.0202e+02	3.1607e+01	9.0125e+01	3.2278e+00	-4.3393e-01	4.1532e+02	3.2191e+00
50.05	12-17-93	11:22:57	1.0002e+01	8.5502e+01	2.0022e+00	7.9834e+00	1.3469e+02	3.5656e+01	9.0684e+01	3.7775e+00	-4.3094e-01	4.1638e+02	4.7735e+00
51.05	12-17-93	11:24:59	1.0000e+01	8.5383e+01	2.0022e+00	8.9551e+00	1.5036e+02	3.7822e+01	9.0840e+01	3.9754e+00	-4.6396e-01	4.1783e+02	5.6412e+00
52.02	12-17-93	11:25:29	9.9899e+00	8.5329e+01	2.0033e+00	8.9428e+00	1.5069e+02	3.7724e+01	9.1105e+01	3.9947e+00	-4.5374e-01	4.1981e+02	5.6362e+00

APPENDIX - B

Steady-State Data Points

This appendix contains DAS reports of measured and calculated data for several selected readings for tests from 6/30/93 to 12/17/93.

The data and calculated results summarized in this Appendix constitute the key information recorded during the tests on the SPRE.

For each reading the average and precision values are calculated. In the DAS reports the calculated precision values are the 90% confidence limits (90%.cl) of the mean values. That is, there is a 90% probability that the true mean will fall within this tolerance. This tolerance does not account for uncertainty due to instrument bias or calibration errors, which are thought to be less than 1% for most measurements.

A copy of the channel assignment file is included for reference. A listing of the calculation subroutine is also included. The subroutine is written in C language. However, once an understanding of pointers is grasped, the calculations are reasonably easy to interpret.

Table B-1 Measured Dynamic Channel Definitions

Label	Units	Description
Xp	mm	Power piston position
Xd	mm	Displacer position
Pcs	Pa	Compression space pressure
Pes	Pa	Expansion space pressure
Padgs	Pa	Aft displacer gas spring pressure
Ppgs	Pa	Power piston gas spring pressure
Pfdgs	Pa	Fwd displacer gas spring pressure
Ialt	Amps	AC Alternator current
Valt	Volts	AC Alternator terminal voltage
Vacld	Volts	AC Load voltage
Vcap	Volts	AC Tuning capacitance voltage
Iaux	Amps	Auxiliary load current

Table B-2 Measured Steady-State Channel Definitions

Label	Units	Description
Freque	Hz	Engine frequency (from dynamic channel)
Freq	Hz	Engine frequency (from frequency-dc converter)
Pmean	Pa	Absolute mean engine pressure
dPdbrg	kPa	Displacer bearing dP
dPpbrg	kPa	Piston bearing dP
Perderr	-	Period error ratio
Xpar	m	Rms Piston amplitude
Xdar	m	Rms Displacer amplitude
Kwsmh	Kw	Salt main heater power
Kwssh	Kw	Salt sump heater power
Kwalt	Kw	Alternator load power (by Clark-Hess instrument)
Kwaltb	Kw	Alternator load power (by F.W. Bell instrument)
Kwlddc	Kw	Load DC power
Kwalts	Kw	Starter power
Fleh	l/s	Engine Heater Flow
Flec	l/s	Engine Coolant Flow
Flac	l/s	Alternator Coolant Flow
Flcwt	l/s	Total Coolant flow
Tzero	C	Ice Point reference
Toven2	C	Thermocouple Oven 2 reference
Toven3	C	Thermocouple Oven 3 reference
Toven4	C	Thermocouple Oven 4 reference
Tehi	C	Engine heater inlet temp (-dTeha)
Tehid	C	Engine heater inlet temp (-dTeh)
dTeha	C	Engine heater out delta temp (Teho-Tehi)
dTeh	C	Engine heater delta temp, Tehod-Tehid
Teho	C	Engine heater outlet temp (+dTeha)
Tehod	C	Engine heater outlet temp (+dTeh)
Teci	C	Engine coolant inlet temp (-dTeca)
Tecid	C	Engine coolant inlet temp (-dTec)
dTeca	C	Engine coolant delta temp (Teco-Teci)
dTec	C	Engine coolant delta temp (Tecod-Tecid)
Teco	C	Engine coolant outlet temp (+dTeca)
Tecod	C	Engine coolant outlet temp (+dTec)
Taci	C	Alternator coolant outlet temp (-dTac)
dTac	C	Alternator coolant delta temp (Taco-Taci)
Taco	C	Alternator coolant outlet temp (+dTac)
Tcwli	C	Load coolant inlet temp

Table B-2 (continued) Measured Steady-State Channel Definitions

Label	Units	Description
dTcwl	C	Load coolant delta temp
dTcws1	C	Series Load coolant delta temp
dTectp	C	Engine coolant delta junction type-T Thermopile
dPdbf	mv	Displacer bearing flow differential pressure
dPpbf	mv	Piston bearing flow differential pressure
Peci	kPa	Engine coolant inlet pressure
Peco	kPa	Engine coolant outlet pressure
Paci	kPa	Alternator coolant inlet pressure
Paco	kPa	Alternator coolant outlet pressure
Pcwp	kPa	Cooling water pump inlet pressure
Pspair	kPa	Salt pump cooling air
Pdbrgs	MPa	Displacer bearing supply
Ppbrgs	MPa	Piston bearing supply
Pbrgri	MPa	Bearing return (boost pump in)
Pstreg	MPa	Regulated supply pressure
dPcwp	kPa	Cooling water pump delta
Vdc	Volts	DC Load voltage
Idc	Amps	DC Load current
Tcs	C	Compression space temp.
Tcs2	C	Compression space temp.
Tfdgs	C	Piston gas spring temp. (position sensor # 1)
Tadgs	C	Piston gas spring (position sensor # 2)
Tpgs	C	Piston gas spring (position sensor # 1)
Tpgs2	C	Piston gas spring (position sensor #2)
Tes	C	Expansion space closure head 33 deg position
Tes2	C	Expansion space closure head bottom
Tes3		Reserved NOT used
Tes4		Reserved NOT used
Thwld	C	Reserved NOT used
Thwld2	C	Reserved NOT used
Tcyl	C	Piston cylinder temp.
Talt	C	Alternator outer stator lamination temp.
Tgr	C	Regenerator/cooler plenum temp.
Tgr2	C	Regenerator/cooler plenum temp.
Tjrsrf	C	Joining ring surface temp.
Tsesrf	C	Spool engine end surface temp.
Tsbsrf	C	Spool balancer end surface temp.
Tesrf	C	Expansion space outer surface (near heater)
Tesrf2	C	Expansion space outer surface (1st closure)

Table B-2 (continued) Measured Steady-State Channel Definitions

Label	Units	Description
Tesrf3	C	Expansion space outer surface (center of backup closure)
Tghr	C	Heater/regenerator plenum
Tghr2	C	Heater/regenerator plenum
Tghr3	C	Heater/regenerator plenum
Tghr4	C	Heater/regenerator plenum
Tascyl	C	Aft displacer spring cylinder temp.
Tkman	C	Kayman rack ambient
Tkman2	C	Kayman box temp.
Tkman3	C	Kayman SE-13 ambient
Tctws	C	Cooling tower water supply
Tctwr	C	Cooling tower water return
Tcwhei	C	Cooling water exchanger in
Tcwheo	C	Cooling water exchanger out
Tcwc	C	Cooling water control
Tbrgr	C	Bearing return
Tdbrgs	C	Displacer bearing supply
Tpbrgs	C	Piston bearing supply
Tsresa	C	Regenerator Surface Temp.
Tsresb	C	Regenerator Surface Temp.
Disz	m	Lateral case displacement
Velx	m/s	Axial case velocity
Vely	m/s	Vertical case velocity
Velz	m/s	Lateral case velocity
Accx	m/s ²	Axial case acceleration
Accy	m/s ²	Vertical case acceleration
Accz	m/s ²	Lateral case acceleration
Vsp	volts	Load control set-point
Mtrspd	RPM	Motor speed
Patm	Pa	Abs. atmospheric pressure (const)

Table B-3 Constant Parameter Definitions

Label	Units	Description
Drod	m	Displacer rod diameter
Dfds	m	Fwd displacer spring piston diameter
Dads	m	Aft displacer spring piston diameter
Dpist	m	Power piston diameter
Ddisp	m	Displacer seal diameter
Mdisp	kg	Displacer mass
Mpist	kg	Power piston mass
Mcase	kg	Case mass
akmag	n/m	Alternator magnetic stiffness
ehm	---	Salt loop mixer coefficient
ecm	---	Coolant loop mixer coefficient
apist	m ²	Power piston area (calculated)
aads	m ²	Aft displacer spring area (calculated)
afds	m ²	Fwd displacer spring area (calculated)
arod	m ²	Thermodynamic rod area (calculated)

Table B-4 Calculated Results Definitions

Label	Units	Description
tehw	C	Heater wall temperature
tecw	C	Cooler wall temperature
trtow	K/K	Heater/cooler temp ratio
tehf	C	Heater fluid temperature
tecf	C	Cooler fluid temperature
tclna	C	Coolant fluid temperature
trtof	K/K	Heater/cooler fluid temp ratio
trtec		
pvpst	kW	Piston PV power
pwalt	kW	Alternator terminal power
pwacld	kW	Total load power
palts	kW	Alternator shaft power
etcrno	---	Carnot efficiency
etapvh	---	PV efficiency (Qin)
etapvc	---	PV efficiency (Qrej)
etalt	---	Alternator efficiency
etsys	---	System efficiency (Qin)
dsfrq	Hz	Design frequency at operating pressure
xdrp	mm/mm	Displacer/piston amplitude

Table B-4 (continued) Calculated Results Definitions

Label	Units	Description
xdspet	---	$X_d/X_p \cdot \sin(\text{phid}) \cdot \text{etcno}$
vpa	m/s	Piston velocity amplitude
vda	m/s	Displacer velocity amplitude
xca	mm	Case amplitude
xcph	deg	Case phase with respect to X_p
pwads	kW	Aft displacer spring pwr. loss
pnads	kW	Aft displacer spring pwr. loss (normalized to 10mm amplitude)
akads	n/m	Aft displacer spring stiffness
cads	n-s/m	Aft displacer spring damping coefficient
phads	deg	Angle (Aft displacer spring press. vs. vol. displacement)
pwfds	kW	Fwd. displacer spring pwr. loss
pnfds	kW	Fwd. displacer spring pwr. loss (normalized to 10mm amplitude)
akfds	n/m	Fwd. displacer spring stiffness
cfds	n-s/m	Fwd. displacer spring damping coefficient
phfds	deg	Angle (fwd. displacer spring press. vs. vol. displacement)
pvpns	kW	Normalized PV power
pwaps	kW	Piston spring power loss
pnaps	kW	Normalized power piston spring loss
akaps	n/m	Piston spring stiffness
caps	n-m/s	Piston spring damping coefficient
phaps	deg	Angle (piston spring press. vs. vol. displacement)
pci	MPa	Ideal pressure amplitude
pcphi	deg	Ideal pressure phase
pea	MPa	Calc. expansion space pressure amplitude
peph	deg	Calc. expansion space pressure phase
dpa	MPa	Calc. heat exchanger pressure drop amplitude
dpph	deg	Calc. heat exchanger pressure drop phase
pcpm	---	Pressure amplitude / mean pressure
pratio	---	Max/min pressure ratio
dtslt	C	Salt differential temp.
qeh	kW	Heat input to engine heater
qec	kW	Heat rejected by engine cooler
qac	kW	Heat rejected by alternator cooler
dtffh	C	Heater fluid filter temperature differential
flehc	l/s	Corrected heater flow rate
dpehm	kPa	Heater liquid press. drop
pwrehm	kW	Heater liquid flow loss
dpecm	kPa	Cooler liquid press. drop
pwrecm	kW	Cooler liquid flow loss

Note: phid - Phase angle between displacer and power piston

Table B-4 (continued) Calculated Results Definitions

Label	Units	Description
qbleng	---	Engine energy balance ratio
qblalt	---	Alternator energy balance ratio
qblsys	---	System energy balance ratio
dtffc	C	Cooler liquid film temp. differential
tqin	C	Avg. cooler inlet temp.
tqrj	C	Avg. coolant temp.
pwrfd	1/m	Displacer pressure factor
pwrfc	1/m	Piston pressure factor
pwdrd	kW	Compression space to displacer rod power
pwtds	kW	Total displacer gas spring loss
pwpm	kW	Displacer pumping power
falta	n	Alternator force amplitude
faltph	deg	Alternator force phase
balte	V-s/m	Generated voltage/pwr. piston velocity
paltls	kW	Alternator power loss
cap	uf	Tuning capacitor
aind	mH	Effective alt inductance
baltm	N/Amp	Electrical force/current
pwdcas	kW	Displacer to case power transfer
pwpmn	kW	Normalized displacer pumping pwr.
prwprm	kW	Power parameter (see "CLNSPRE.C" listing)
rhosl	kg/l	Salt density
cpst	kW.s/kg-C	Salt specific heat
muslt	---	Salt viscosity (see "CLNSPRE.C" listing)
rho	kg/l	Coolant density
cp	kW.s/kg-C	Coolant specific heat
mu	---	Coolant viscosity (see "CLNSPRE.C" listing)
prn	---	Coolant Prandlt No.
rload	ohms	Load Resistance
phasld	deg	Load Phase, (between vacld.p and ialt.p)

Rdg.Pt	Date	Time	Pmean	Freque	trtow	XP.a	vacld.r	Ialt.r	Ialt.p	rload	phasld	cap	pwacld
53.02	12-17-93	11:25:50	9.9659e+00	8.5284e+01	2.0038e+00	9.0006e+00	1.4974e+02	3.7658e+01	9.0994e+01	3.9763e+00	-4.5048e-01	4.1417e+02	5.5789e+00
54.05	12-17-93	11:26:55	1.0012e+01	8.5294e+01	2.0013e+00	9.9903e+00	1.6433e+02	3.9188e+01	9.0547e+01	4.1934e+00	-4.4393e-01	4.1428e+02	6.3807e+00
55.05	12-17-93	11:39:05	1.2532e+01	9.5206e+01	2.0021e+00	6.0473e+00	1.1158e+02	3.8874e+01	9.0545e+01	2.8703e+00	-3.2583e-01	3.3668e+02	4.3187e+00
56.05	12-17-93	11:41:18	1.2507e+01	9.4744e+01	2.0029e+00	8.0228e+00	1.4682e+02	4.3641e+01	9.1233e+01	3.3642e+00	-3.3113e-01	3.3668e+02	6.3429e+00
57.05	12-17-93	11:43:34	1.2505e+01	9.4573e+01	2.0030e+00	8.9795e+00	1.6430e+02	4.5657e+01	9.1573e+01	3.5986e+00	-3.3995e-01	3.3948e+02	7.4082e+00
58.02	12-17-93	11:43:58	1.2488e+01	9.4533e+01	2.0028e+00	9.0183e+00	1.6388e+02	4.5445e+01	9.1934e+01	3.6061e+00	-3.6066e-01	3.3743e+02	7.3512e+00
59.02	12-17-93	11:44:15	1.2487e+01	9.4500e+01	2.0021e+00	9.0107e+00	1.6407e+02	4.5396e+01	9.2168e+01	3.6144e+00	-3.8490e-01	3.3812e+02	7.3495e+00
60.05	12-17-93	11:45:29	1.2507e+01	9.4452e+01	2.0000e+00	9.9883e+00	1.7902e+02	4.6466e+01	9.1906e+01	3.8528e+00	-3.2728e-01	3.3614e+02	8.1968e+00
61.05	12-17-93	12:04:22	1.5035e+01	1.0341e+02	2.0071e+00	6.0573e+00	1.1925e+02	4.4578e+01	9.0847e+01	2.6752e+00	-2.2914e-01	2.8580e+02	5.3109e+00
62.05	12-17-93	12:05:55	1.5087e+01	1.0314e+02	1.9983e+00	8.0345e+00	1.5771e+02	4.9031e+01	9.1065e+01	3.2167e+00	-2.4489e-01	2.8632e+02	7.7164e+00
63.05	12-17-93	12:08:29	1.5074e+01	1.0293e+02	1.9992e+00	9.0454e+00	1.7652e+02	5.1001e+01	9.1189e+01	3.4611e+00	-2.3320e-01	2.8737e+02	8.9717e+00
64.05	12-17-93	12:09:59	1.5036e+01	1.0272e+02	1.9909e+00	1.0036e+01	1.9295e+02	5.0578e+01	9.1631e+01	3.8150e+00	-2.4448e-01	2.8565e+02	9.7062e+00
65.05	12-17-93	12:14:21	1.5054e+01	1.0285e+02	2.0027e+00	9.4230e+00	1.8245e+02	5.0994e+01	9.1582e+01	3.5779e+00	-2.4394e-01	2.8605e+02	9.2646e+00
66.05	12-17-93	12:16:13	1.5040e+01	1.0275e+02	2.0016e+00	1.0019e+01	1.9335e+02	5.1385e+01	9.1813e+01	3.7628e+00	-2.4096e-01	2.8723e+02	9.8823e+00
67.02	12-17-93	12:29:04	1.5092e+01	1.0301e+02	1.9975e+00	8.9593e+00	1.7384e+02	4.9311e+01	9.1225e+01	3.5255e+00	-2.6365e-01	2.8417e+02	8.5466e+00

SPRE PC/TDAS Build 13, Report Date: Fri Jul 15 14:10:16 1994
 DataFile: 063093.dta ChanFile: chspre05 DATE: 06-30-93 TIME: 10:06:48
 Avg of 5 RdgNs: 26.*

DYNAMIC DATA, ncy: 4, nsam: 257

Mo,	Name,	Mean,	Amplitude,	Phase,	THD,	RMS
1	Xp	-1.6018e+00	8.0362e+00	0.000	4.6477e-02	5.6887e+00
	90%.cl	±5.5e-02	±1.5e-02	±0.000	±5.7e-03	±1.2e-02
2	Xd	1.0731e+00	8.2068e+00	72.129	4.6299e-02	5.8093e+00
	90%.cl	±6.2e-02	±3.6e-02	±0.544	±4.7e-03	±2.6e-02
3	Pcs	1.2576e-04	4.7018e-01	-11.457	6.5294e-02	3.3318e-01
	90%.cl	±7.8e-03	±1.3e-03	±0.164	±6.6e-03	±8.5e-04
4	Pes	-2.8623e-03	4.8005e-01	-14.539	6.9966e-02	3.4028e-01
	90%.cl	±2.8e-03	±4.1e-03	±0.506	±4.2e-03	±2.9e-03
5	Padgs	-3.7516e-02	5.5565e-01	73.802	7.0964e-02	3.9389e-01
	90%.cl	±1.1e-02	±2.0e-03	±0.605	±6.0e-03	±1.3e-03
6	Ppgs	-1.9196e-03	1.6992e-01	-178.019	4.6363e-02	1.2028e-01
	90%.cl	±7.0e-03	±2.0e-04	±0.053	±4.3e-03	±1.5e-04
7	Pfdgs	-6.0829e-03	5.8208e-02	-97.385	6.4425e-02	4.1246e-02
	90%.cl	±7.9e-03	±7.3e-04	±0.589	±7.9e-03	±5.3e-04
8	Ialt	2.6516e-02	2.8865e+01	90.746	5.5887e-02	2.0443e+01
	90%.cl	±2.1e-01	±9.8e-02	±0.371	±5.3e-03	±6.8e-02
9	Valt	2.2234e-01	1.7334e+02	56.370	5.3265e-02	1.2275e+02
	90%.cl	±1.2e+00	±6.4e-01	±0.351	±5.8e-03	±4.7e-01
10	Vacld	8.5713e-02	1.4194e+02	89.942	5.5063e-02	1.0052e+02
	90%.cl	±9.8e-01	±4.5e-01	±0.370	±5.4e-03	±3.2e-01
11	Vcap	2.1541e-01	9.4482e+01	0.108	4.7235e-02	6.6884e+01
	90%.cl	±4.6e-01	±2.7e-01	±0.051	±5.8e-03	±1.9e-01
12	Iaux	7.9797e-04	0.0000e+00	0.000	0.0000e+00	2.7769e-03
	90%.cl	±1.7e-04	±0.0e+00	±0.000	±0.0e+00	±2.2e-04

STEADY STATE DATA

Freque	Freq	Pmean	dPdbrg	dPpbrg	Perderr	Xpar	Xdar	Kwsmh
6.2083e+01	6.2112e+01	5.0252e+00	1.1458e+03	1.1758e+03	3.3786e-01	8.0261e-03	8.0819e-04	2.3090e+01
±4.2e-02	±4.1e-02	±8.1e-03	±6.4e+00	±2.1e+00	±4.4e-04	±1.0e-05	±1.9e-06	±1.3e+01
Kwssh	Kwalt	Kwaltb	Kwlddc	Kwalts	Fleh	Flec	Flac	Flcwt
-8.8770e-03	2.0750e+00	2.0410e+00	2.0541e+00	6.2012e-04	1.1951e+00	1.1241e+00	5.1466e-02	1.1638e+00
±0.0e+00	±3.9e-03	±3.4e-02	±2.9e-03	±5.0e-03	±1.6e-03	±4.4e-02	±1.8e-03	±4.0e-02
Tzero	Toven2	Toven3	Toven4	Tehi	Tehid	dTeha	dTeh	Teho
0.0000e+00	6.6017e+01	6.5242e+01	6.4846e+01	3.0473e+02	3.0451e+02	-3.0338e+00	-2.5294e+00	3.0137e+02
±0.0e+00	±1.3e-01	±7.7e-02	±7.2e-02	±1.2e-01	±2.1e-01	±7.9e-02	±3.6e-02	±1.5e-01
Tehod	Teci	Tecid	dTeca	dTec	Teco	Tecod	Taci	dTac
3.0177e+02	1.2954e+01	1.2204e+01	1.8107e+00	1.7710e+00	1.5253e+01	1.3951e+01	1.3833e+01	1.5324e+00
±8.5e-02	±8.2e-02	±1.2e-01	±6.0e-02	±7.8e-02	±1.1e-01	±1.4e-01	±2.1e-01	±5.8e-02
Taco	Tcwl	dTcwl	dTcwl	dTectp	dPdbf	dPpbf	Peci	Peco
1.5243e+01	1.4010e+01	5.5180e-01	0.0000e+00	1.6860e-03	1.2594e+03	1.7616e+03	2.3278e+02	1.3082e+02
±2.1e-01	±1.3e-01	±1.7e-01	±0.0e+00	±1.5e-05	±1.5e+00	±1.2e+01	±1.7e+01	±9.9e+00
Paci	Paco	Pcpwi	Pspair	Pdbrgs	Ppbrgs	Pbrgri	Pstreg	dPcpw
0.0000e+00	1.0826e+02	-2.3721e+01	2.3768e+01	5.9899e+00	6.0355e+00	4.8682e+00	1.6078e+01	4.9320e+05
±0.0e+00	±8.1e+00	±2.0e+00	±5.2e-02	±2.9e-03	±1.4e-02	±1.2e-02	±5.2e-02	±3.3e+04
Vdc	Idc	Tcs1	Tcs2	Tfdgs	Tadgs	Tpgs1	Tpgs2	Tes1
1.0016e-01	0.0000e+00	0.0000e+00	1.2706e+01	0.0000e+00	0.0000e+00	2.1852e+01	0.0000e+00	2.9211e+02
±6.9e-05	±0.0e+00	±0.0e+00	±5.6e-02	±0.0e+00	±0.0e+00	±1.9e-01	±0.0e+00	±1.7e-01
Tes2	Tes3	Tes4	Thwld1	Thwld2	Tcyl	Talt	Tgr1	Tgr2
2.9313e+02	0.0000e+00	0.0000e+00	1.2876e+02	8.5454e+01	2.1934e+01	1.9984e+01	1.2336e+01	1.5848e+01
±2.1e-01	±0.0e+00	±0.0e+00	±1.6e-01	±1.9e-01	±2.6e-01	±1.3e-01	±1.1e-01	±1.4e-01

STEADY STATE DATA

Tjrsrf	Tsesrf	Tsbsrf	Tesrf1	Tesrf2	Tesrf3	Tghr1	Tghr2	Tghr3
2.0949e+01	2.2291e+02	4.7856e+01	2.7428e+02	2.4585e+02	2.4334e+02	0.0000e+00	0.0000e+00	0.0000e+00
±1.5e-01	±1.1e-01	±1.0e-01	±1.2e-01	±2.1e-01	±3.2e-01	±0.0e+00	±0.0e+00	±0.0e+00
Tghr4	Tascyl	Tkman1	Tkman2	Tkman3	Tctws	Tctwr	Tcwei	Tcwheo
0.0000e+00	-6.9267e+01	2.4187e+01	2.5237e+01	2.1383e+01	6.9484e+00	6.1775e+00	5.1671e+01	9.7362e+00
±0.0e+00	±1.4e-01	±9.4e-02	±1.1e-01	±1.0e-01	±1.6e-01	±8.4e-02	±1.7e-01	±1.7e-01
Tcwc	Tbrgr	Tdbrgs	Tpbrgs	Tsresa	Tsresb	Disz	Velx	Vely
1.2920e+01	2.1561e+01	3.0907e+01	3.8157e+01	3.0525e+02	3.0489e+02	0.0000e+00	1.0426e-02	1.4803e-03
±1.5e-01	±7.1e-02	±1.4e-01	±1.1e-01	±1.8e-01	±1.4e-01	±0.0e+00	±6.4e-05	±2.2e-05
Velz	Accx	Accy	Accz	Vsp	Mtrspd	Patm		
0.0000e+00	1.5598e-03	8.9788e-04	6.1771e-02	9.7312e+01	0.0000e+00	1.0000e+05		
±0.0e+00	±2.2e-05	±2.8e-05	±6.3e-05	±0.0e+00	±0.0e+00	±0.0e+00		

CALCULATIONS, rev: cinspre

tehw	tecw	trtow	tehf	tecf	tclna	trtof	trtec*	pvpst
3.0170e+02	1.4313e+01	1.9997e+00	3.0321e+02	1.3859e+01	1.3859e+01	2.0082e+00	0.0000e+00	2.4099e+00
±1.7e-01	±8.5e-02	±5.8e-04	±1.4e-01	±7.5e-02	±7.5e-02	±5.7e-04	±0.0e+00	±2.7e-02
pwalt	pwacld	palts	etcno	etaph	etapvc	etalt	etsys	dsfrq
2.0648e+00	2.0484e+00	2.2450e+00	4.9993e-01	2.2324e-01	2.2004e-01	9.1977e-01	1.9128e-01	5.7880e+01
±1.5e-02	±1.3e-02	±2.3e-02	±1.4e-04	±6.0e-03	±7.6e-03	±6.5e-03	±5.0e-03	±4.6e-02
xdrp	xdspet	vpa	vda	xca	xcph	pwads	pnads	akads
1.0212e+00	3.9048e-03	3.1347e+00	3.2013e+00	3.6438e-02	-1.7097e+02	1.0009e-01	1.4862e-01	2.6097e+05
±5.3e-03	±1.2e-05	±4.6e-03	±1.5e-02	±1.0e-04	±4.4e-02	±4.2e-03	±6.6e-03	±6.9e+02
cads	phads	pwfds	pnfds	akfds	cfds	phfds	pvpns	pwaps
1.9534e+01	1.8167e+02	6.8658e-02	1.0194e-01	2.8242e+04	1.3399e+01	1.9049e+02	3.7316e+00	1.5155e-01
±8.7e-01	±7.2e-02	±3.5e-03	±5.3e-03	±2.9e+02	±7.1e-01	±5.8e-01	±4.9e-02	±4.2e-03
pnaps	akaps	caps	phaps	pci*	pcphi*	pea*	peph*	dpa*
2.3467e-01	3.4788e+05	3.0845e+01	1.8198e+02	1.4972e-01	-1.6512e+02	4.6851e-01	-1.4928e+01	2.8478e-02
±6.6e-03	±5.6e+02	±8.5e-01	±5.3e-02	±5.2e-04	±7.7e-02	±1.4e-03	±1.7e-01	±2.7e-04
dpph*	pcpm	pratio	dtslt*	qeh1	qec1	qac	dtffh	fleh
7.3445e+01	9.3564e-02	1.2064e+00	0.0000e+00	1.0798e+01	8.5474e+00	3.3105e-01	1.5082e+00	1.2076e+00
±6.8e-01	±1.7e-04	±4.3e-04	±0.0e+00	±2.7e-01	±3.3e-01	±3.8e-03	±3.9e-02	±1.6e-03
dpehm	pwrehm	dpecm	pwrecm	qbleng	qblalt	qblsys	dtffc	tqin*
1.1449e+02	1.3827e-01	5.0414e+01	5.6761e-02	1.0154e+00	9.9423e-01	1.0141e+00	4.5422e-01	7.6522e+00
±3.1e-01	±5.6e-04	±3.9e+00	±6.6e-03	±5.3e-02	±7.2e-03	±5.4e-02	±1.8e-02	±2.1e-02
trqj*	pwrfcd	pwrfcp	pwdrd	pwtids	pwmp	falta	faltph	balte
5.0976e+00	-2.3794e+00	1.2157e+01	1.4475e-01	1.6875e-01	-1.0712e-02	1.1859e+07	-7.1483e-04	4.5644e+01
±2.4e-02	±2.5e-02	±1.1e-02	±4.0e-04	±1.3e-03	±1.7e-03	±1.6e+04	±3.3e-06	±2.4e-01
palts	cap	aind	balrm	pwdcas	pwmpn	prwprm	rhoslt	cpslt
1.8018e-01	7.8319e+02	8.5272e+00	4.1085e+05	1.3287e-02	-1.5913e-02	9.7898e-03	1.8616e+00	1.5630e+00
±1.6e-02	±3.8e+00	±1.1e-01	±1.7e+03	±4.0e-05	±2.6e-03	±2.1e-05	±1.1e-04	±0.0e+00
muslt	rhocl	cpcl	mucl	prncl				
3.1327e+00	1.0011e+00	4.1958e+00	1.2036e+00	8.1218e+00				
±3.1e-03	±1.2e-05	±7.7e-05	±2.3e-03	±1.9e-02				

CONSTANTS

DROD	DFDS	DADS	DPIST	DDISP	MDISP	MPIST	MCASE	AKMAG
4.5720e-02	8.5126e-02	8.3666e-02	1.4478e-01	1.1414e-01	1.6789e+00	9.7420e+00	2.2930e+03	1.3290e-05
ehm	ecm	apist	aads	afds	arod			
2.2727e-02	2.2727e-02	1.6463e-02	3.8561e-03	4.0496e-03	1.9355e-04			

SPRE PC/TDAS Build 13, Report Date: Fri Jul 15 14:10:16 1994
 DataFile: 063093.dta ChanFile: chspre05 DATE: 06-30-93 TIME: 12:18:51
 Avg of 5 RdgNs: 57.*

DYNAMIC DATA, ncy: 4, nsam: 257

No,	Name,	Mean,	Amplitude,	Phase,	THD,	RMS
1	Xp	-9.1916e-01	8.0196e+00	0.000	1.0462e-01	5.7017e+00
	90%.cl	±8.7e-02	±5.3e-02	±0.000	±7.6e-03	±4.1e-02
2	Xd	-1.4408e-01	8.9780e+00	76.306	1.0537e-01	6.3836e+00
	90%.cl	±1.4e-01	±7.3e-02	±0.935	±6.5e-03	±5.3e-02
3	Pcs	-3.8719e-02	1.2010e+00	-10.480	1.1367e-01	8.5469e-01
	90%.cl	±1.2e-02	±4.7e-03	±0.191	±9.8e-03	±3.7e-03
4	Pes	-4.6242e-03	1.2433e+00	-15.264	1.1670e-01	8.8515e-01
	90%.cl	±1.1e-02	±3.0e-03	±0.222	±9.4e-03	±2.4e-03
5	Padgs	1.2287e-03	1.5349e+00	77.844	1.2229e-01	1.0934e+00
	90%.cl	±2.6e-02	±1.4e-02	±0.953	±8.1e-03	±9.0e-03
6	Ppgs	-9.0156e-02	4.3584e-01	-178.415	1.0428e-01	3.0986e-01
	90%.cl	±9.5e-03	±3.1e-03	±0.074	±6.9e-03	±2.3e-03
7	Pfdgs	-2.9712e-02	1.6822e-01	-92.911	1.0868e-01	1.1965e-01
	90%.cl	±2.1e-02	±1.5e-03	±0.807	±8.1e-03	±1.0e-03
8	Ialt	-1.2987e-01	6.4885e+01	91.304	1.0543e-01	4.6135e+01
	90%.cl	±1.1e+00	±4.8e-01	±0.357	±7.7e-03	±3.4e-01
9	Valt	-8.1975e-01	3.8569e+02	33.201	1.0465e-01	2.7422e+02
	90%.cl	±5.4e+00	±2.9e+00	±0.461	±7.5e-03	±2.3e+00
10	Vacld	-8.7501e-01	2.0460e+02	91.033	1.0529e-01	1.4547e+02
	90%.cl	±3.5e+00	±1.6e+00	±0.353	±7.5e-03	±1.1e+00
11	Vcap	1.3356e-01	3.2359e+02	0.821	1.0471e-01	2.3007e+02
	90%.cl	±3.0e+00	±2.9e+00	±0.166	±7.4e-03	±2.2e+00
12	Iaux	8.0557e-04	0.0000e+00	0.000	0.0000e+00	2.7854e-03
	90%.cl	±1.9e-04	±0.0e+00	±0.000	±0.0e+00	±2.6e-04

STEADY STATE DATA

Freque	Freq	Pmean	dPdbrg	dPpbrg	Perderr	Xpar	Xdar	Kwsmh
9.4621e+01	9.4729e+01	1.2496e+01	1.1391e+03	1.2156e+03	3.4342e-01	8.0235e-03	8.9187e-04	1.3210e+00
±6.3e-02	±8.0e-02	±2.4e-02	±1.4e+01	±1.4e+01	±4.4e-04	±1.7e-05	±4.2e-06	±2.0e-02
Kwssh	Kwalt	Kwaltb	Kwlddc	Kwalts	Fleh	Flec	Flac	Flcwt
-1.9529e-02	6.9203e+00	6.7633e+00	9.6425e+00	-4.3408e-03	1.1795e+00	1.2024e+00	5.5384e-02	1.2466e+00
±9.2e-03	±1.0e-02	±4.6e-02	±1.8e-02	±5.0e-03	±2.5e-03	±1.8e-02	±8.9e-04	±1.6e-02
Tzero	Toven2	Toven3	Toven4	Tehi	Tehid	dTeha	dTeh	Teho
0.0000e+00	6.6025e+01	6.5237e+01	6.4840e+01	3.3400e+02	3.3385e+02	-1.0859e+01	-1.0354e+01	3.2284e+02
±0.0e+00	±8.2e-02	±7.1e-02	±3.6e-02	±2.3e-01	±8.1e-02	±1.1e-01	±7.1e-02	±6.4e-02
Tehod	Teci	Tecid	dTeca	dTec	Teco	Tecod	Taci	dTac
3.2330e+02	1.9963e+01	1.9376e+01	5.8834e+00	5.9347e+00	2.6431e+01	2.5170e+01	2.0765e+01	4.2006e+00
±1.7e-01	±2.0e-01	±1.7e-01	±1.4e-01	±9.4e-02	±5.5e-02	±8.1e-02	±1.9e-01	±1.0e-01
Taco	Tcwl	dTcwl	dTcwl	dTectp	dPdbf	dPpbf	Peci	Peco
2.4736e+01	2.5075e+01	1.2709e+00	0.0000e+00	5.8897e-03	1.3332e+03	2.2592e+03	2.6054e+02	1.4773e+02
±1.0e-01	±1.3e-01	±8.3e-02	±0.0e+00	±7.5e-05	±7.0e+00	±2.4e+01	±7.4e+00	±3.9e+00
Paci	Paco	Pcwp	Pspair	Pdbrgs	Ppbrgs	Pbrgri	Pstreg	dPcp
0.0000e+00	1.2277e+02	-2.6662e+01	2.3354e+01	1.3440e+01	1.3536e+01	1.2305e+01	1.6126e+01	5.5861e+05
±0.0e+00	±3.9e+00	±8.1e-01	±2.5e-02	±6.1e-03	±1.8e-02	±2.1e-02	±1.0e-02	±1.4e+04
Vdc	Idc	Tcs1	Tcs2	Tfdgs	Tadgs	Tpgs1	Tpgs2	Tes1
1.4497e-01	0.0000e+00	0.0000e+00	2.6739e+01	0.0000e+00	0.0000e+00	3.9222e+01	0.0000e+00	3.1649e+02
±1.5e-04	±0.0e+00	±0.0e+00	±1.3e-01	±0.0e+00	±0.0e+00	±2.2e-01	±0.0e+00	±1.5e-01
Tes2	Tes3	Tes4	Thwld1	Thwld2	Tcyl	Talt	Tgcr1	Tgcr2
3.2762e+02	0.0000e+00	0.0000e+00	1.2671e+02	8.5070e+01	3.8095e+01	3.6419e+01	2.5560e+01	3.0857e+01
±2.3e-01	±0.0e+00	±0.0e+00	±1.1e-01	±1.3e-01	±2.6e-01	±1.1e-01	±1.7e-01	±7.0e-02

SPRE PC/TDAS Build 13, Report Date: Fri Jul 15 14:10:16 1994
 DataFile: 063093.dta ChanFile: chspre05 DATE: 06-30-93 TIME: 12:18:51
 Avg of 5 RdgNs: 57.*

STEADY STATE DATA

Tjrsrf	Tsesrf	Tsbsrf	Tesrf1	Tesrf2	Tesrf3	Tghr1	Tghr2	Tghr3
3.2823e+01	2.6852e+02	5.4401e+01	3.0285e+02	2.8904e+02	2.9580e+02	0.0000e+00	0.0000e+00	0.0000e+00
±6.2e-01	±6.0e-02	±9.1e-02	±3.7e-01	±3.9e-01	±7.1e-02	±0.0e+00	±0.0e+00	±0.0e+00
Tghr4	Tascyl	Tkman1	Tkman2	Tkman3	Tctws	Tctwr	Tcwei	Tcweo
0.0000e+00	-6.9322e+01	2.4199e+01	2.5342e+01	2.1555e+01	8.4095e+00	5.9019e+00	5.1668e+01	1.4220e+01
±0.0e+00	±8.4e-02	±1.1e-01	±1.6e-01	±1.0e-01	±2.3e-01	±4.4e-02	±6.8e-02	±1.2e-01
Tcwc	Tbrgr	Tdbrgs	Tpbrgs	Tsresa	Tsresb	Disz	Velx	Vely
1.9984e+01	3.5112e+01	3.2038e+01	3.6197e+01	3.3140e+02	3.3121e+02	0.0000e+00	9.6560e-03	8.1359e-04
±9.7e-02	±9.8e-02	±5.4e-02	±8.3e-02	±1.1e-01	±1.5e-01	±0.0e+00	±2.8e-05	±0.0e+00
Velz	Accx	Accy	Accz	Vsp	Mtrspd	Patm		
1.8653e-03	6.1335e-03	5.0195e-03	-6.2737e-02	1.4107e+02	-1.5625e-01	1.0000e+05		
±2.5e-05	±4.5e-04	±4.1e-04	±0.0e+00	±3.5e-02	±4.3e-01	±0.0e+00		

CALCULATIONS, rev: clnspre

tehw	tecw	trtow	tehf	tecf	tcina	trtof	trtec*	pvpst
3.2330e+02	2.4478e+01	2.0040e+00	3.2857e+02	2.2905e+01	2.2905e+01	2.0324e+00	0.0000e+00	8.5722e+00
±2.6e-01	±2.7e-01	±1.0e-03	±2.4e-01	±2.4e-01	±2.4e-01	±9.1e-04	±0.0e+00	±1.1e-01
pwalt	pwald	palts	etcrno	etapvh	etapvc	etalt	etsys	dsfrq
6.6119e+00	6.6378e+00	8.0468e+00	5.0100e-01	2.2900e-01	2.2459e-01	8.2166e-01	1.7663e-01	9.1273e+01
±1.2e-01	±9.9e-02	±9.1e-02	±2.5e-04	±4.2e-03	±3.5e-03	±7.0e-03	±4.3e-03	±8.6e-02
xdrp	xdspet	vpa	vda	xca	xcph	pwads	pnads	akads
1.1195e+00	4.3698e-03	4.7678e+00	5.3376e+00	3.6196e-02	-1.6984e+02	4.2379e-01	5.2583e-01	6.5898e+05
±1.4e-02	±3.2e-05	±3.3e-02	±4.5e-02	±3.0e-04	±1.4e-01	±4.1e-03	±1.1e-02	±1.9e+03
cads	phads	pwfds	pnfds	akfds	cfds	phfds	pvpns	pwaps
2.9754e+01	1.8154e+02	3.4016e-01	4.2195e-01	7.4540e+04	2.3876e+01	1.9078e+02	1.3330e+01	4.7299e-01
±6.1e-01	±3.0e-02	±1.0e-02	±6.7e-03	±6.1e+02	±3.6e-01	±2.0e-01	±2.6e-01	±1.8e-02
pnaps	akaps	caps	phaps	pci*	pcphi*	pea*	peph*	dpa*
7.3561e-01	8.9436e+05	4.1624e+01	1.8158e+02	1.4886e-01	-1.6320e+02	1.2038e+00	-1.6442e+01	1.2510e-01
±3.4e-02	±1.0e+03	±1.9e+00	±7.4e-02	±1.4e-03	±2.4e-01	±4.2e-03	±2.9e-01	±2.1e-03
dpph*	pcpm	pratio	dtslt*	qeh1	qec1	qac	dtffh	flehc
7.7852e+01	9.6106e-02	1.2127e+00	0.0000e+00	3.7437e+01	2.9599e+01	9.7343e-01	5.2654e+00	1.1929e+00
±9.6e-01	±4.1e-04	±1.0e-03	±0.0e+00	±4.2e-01	±5.3e-01	±1.8e-02	±5.4e-02	±2.6e-03
dpehm	pwrehm	dpecm	pwrecm	qbleng	qblalt	qblsys	dtffc	tqin*
1.0946e+02	1.3058e-01	5.6816e+01	6.8330e-02	1.0197e+00	8.8487e-01	9.9337e-01	1.5729e+00	3.2741e+01
±4.8e-01	±8.5e-04	±1.7e+00	±3.1e-03	±2.3e-02	±4.1e-03	±2.3e-02	±2.8e-02	±2.0e-01
tqrj*	pwrfcd	pwrfcp	pwdrd	pwtds	pwmp	falta	faltph	balte
2.3549e+01	-2.0040e+00	1.2315e+01	6.1933e-01	7.6395e-01	-9.2201e-02	2.7492e+07	-7.9992e-04	4.2758e+01
±1.0e-01	±1.7e-02	±2.4e-02	±3.9e-03	±1.1e-02	±7.6e-03	±2.0e+05	±1.1e-05	±6.2e-01
paltis	cap	aind	baltm	pwdcas	pwmpn	pwprn	rhosl	cpslt
1.4349e+00	3.3730e+02	8.3689e+00	4.2372e+05	5.2422e-02	-1.1435e-01	4.1435e-02	1.8426e+00	1.5630e+00
±4.9e-02	±5.0e+00	±1.4e-01	±5.7e+03	±3.6e-04	±8.3e-03	±1.9e-04	±1.8e-04	±0.0e+00
muslt	rhocl	cpcl	mucl	prncl				
2.6440e+00	9.9930e-01	4.1876e+00	9.7639e-01	6.3151e+00				
±4.0e-03	±5.5e-05	±1.8e-04	±4.8e-03	±3.7e-02				

CONSTANTS

DROB	DFDS	DADS	DPIST	DDISP	MDISP	MPIST	NCASE	AKMAG
4.5720e-02	8.5126e-02	8.3666e-02	1.4478e-01	1.1414e-01	1.6789e+00	9.7420e+00	2.2930e+03	1.3290e-05
ehm	ecm	apist	aads	afds	arod			
2.2727e-02	2.2727e-02	1.6463e-02	3.8561e-03	4.0496e-03	1.9355e-04			

SPRE PC/TDAS Build 13, Report Date: Thu Jul 21 09:33:13 1994
 DataFile: 071393.dta ChanFile: chspre05 DATE: 07-13-93 TIME: 10:37:45
 Avg of 5 RdgNs: 25.*

DYNAMIC DATA, ncy: 4, nsam: 257

No,	Name,	Mean,	Amplitude,	Phase,	THD,	RMS
1	Xp	-1.8149e+00	8.9419e+00	0.000	5.4361e-02	6.3324e+00
	90%.cl	±3.3e-02	±2.7e-02	±0.000	±9.6e-03	±2.1e-02
2	Xd	1.0255e+00	8.9152e+00	71.678	5.3781e-02	6.3133e+00
	90%.cl	±1.0e-01	±2.9e-02	±0.456	±9.6e-03	±2.1e-02
3	Pcs	5.9354e-03	5.2046e-01	-10.958	7.5075e-02	3.6906e-01
	90%.cl	±1.2e-02	±1.6e-03	±0.141	±7.6e-03	±1.1e-03
4	Pes	2.8570e-03	5.2108e-01	-13.404	7.6745e-02	3.6955e-01
	90%.cl	±1.3e-02	±2.6e-03	±0.206	±8.6e-03	±1.9e-03
5	Padgs	-1.1672e-02	6.0343e-01	73.342	7.9412e-02	4.2803e-01
	90%.cl	±1.1e-02	±2.8e-03	±0.422	±6.0e-03	±1.8e-03
6	Ppgs	1.9824e-02	1.8962e-01	-177.987	5.3602e-02	1.3428e-01
	90%.cl	±1.4e-02	±7.1e-04	±0.078	±1.1e-02	±4.8e-04
7	Pfdgs	2.6273e-03	6.2306e-02	-98.685	6.0891e-02	4.4140e-02
	90%.cl	±1.4e-02	±3.5e-04	±0.725	±1.1e-02	±2.6e-04
8	Ialt	4.9201e-02	3.0675e+01	90.799	6.7005e-02	2.1739e+01
	90%.cl	±2.8e-01	±7.1e-02	±0.407	±9.3e-03	±4.4e-02
9	Valt	3.2062e-01	1.8794e+02	57.306	6.3887e-02	1.3317e+02
	90%.cl	±1.7e+00	±5.8e-01	±0.391	±8.4e-03	±4.0e-01
10	Vacld	2.2975e-01	1.5615e+02	90.060	6.6282e-02	1.1066e+02
	90%.cl	±1.4e+00	±4.3e-01	±0.406	±9.5e-03	±3.1e-01
11	Vcap	1.7207e-01	1.0059e+02	0.114	5.6171e-02	7.1241e+01
	90%.cl	±5.4e-01	±4.1e-01	±0.092	±9.7e-03	±3.0e-01
12	Iaux	6.7637e-04	0.0000e+00	0.000	0.0000e+00	2.6047e-03
	90%.cl	±2.6e-04	±0.0e+00	±0.000	±0.0e+00	±3.7e-04

STEADY STATE DATA

Freque	Freq	Pmean	dPdbrg	dPpbgr	Perderr	Xpar	Xdar	Kwsmh
6.2037e+01	6.2009e+01	5.0161e+00	1.1379e+03	1.1615e+03	3.3834e-01	8.9224e-03	8.7946e-04	2.7376e+01
±7.7e-02	±6.3e-02	±1.7e-02	±2.2e+01	±1.7e+01	±8.2e-04	±1.6e-05	±1.9e-06	±1.9e+01
Kwssh	Kwalt	Kwaltb	Kwlddc	Kwalts	Fleh	Flec	Flac	Flcwt
-1.2428e-02	2.4297e+00	2.4410e+00	2.4069e+00	-9.3018e-04	1.1884e+00	1.1866e+00	5.5566e-02	1.2329e+00
±6.0e-03	±4.3e-03	±4.0e-02	±3.2e-03	±8.8e-03	±8.7e-04	±4.7e-03	±3.7e-04	±2.8e-03
Tzero	Toven2	Toven3	Toven4	Tehi	Tehid	dTeha	dTeh	Teho
0.0000e+00	6.6020e+01	6.5206e+01	6.4857e+01	3.0575e+02	3.0559e+02	-3.4776e+00	-3.0706e+00	3.0200e+02
±0.0e+00	±8.3e-02	±4.0e-02	±7.6e-02	±1.7e-01	±9.9e-02	±1.6e-01	±1.2e-01	±1.8e-01
Tehod	Teci	Tecid	dTeca	dTec	Teco	Tecod	Taci	dTac
3.0228e+02	1.2736e+01	1.2136e+01	2.0486e+00	1.9860e+00	1.5237e+01	1.3981e+01	1.3775e+01	1.6754e+00
±1.7e-01	±1.7e-01	±7.8e-02	±1.3e-01	±7.9e-02	±1.5e-01	±8.0e-02	±1.2e-01	±6.3e-02
Taco	Tcwl	dTcwl	dTcwl	dTectp	dPdbf	dPpbfg	Peci	Peco
1.5255e+01	1.4393e+01	7.4109e-01	0.0000e+00	1.8598e-03	1.2490e+03	1.8262e+03	2.6013e+02	1.4771e+02
±1.5e-01	±1.8e-01	±4.9e-02	±0.0e+00	±8.0e-06	±4.5e+00	±2.7e+01	±1.1e+00	±1.6e+00
Paci	Paco	Pcpwi	Pspair	Pdbrgs	Ppbgrs	Ppbgr	Pstreg	dPcpw
0.0000e+00	1.2090e+02	-2.6510e+01	-2.5635e-02	5.9767e+00	6.0321e+00	4.8707e+00	1.5588e+01	5.7106e+05
±0.0e+00	±1.2e-01	±1.3e-01	±2.5e-02	±8.9e-03	±1.1e-02	±1.5e-02	±1.1e+00	±1.4e+03
Vdc	Idc	Tcs1	Tcs2	Tfdgs	Tadgs	Tpgs1	Tpgs2	Tes1
1.1028e-01	0.0000e+00	0.0000e+00	1.3036e+01	0.0000e+00	0.0000e+00	2.3067e+01	0.0000e+00	2.9126e+02
±5.3e-05	±0.0e+00	±0.0e+00	±1.2e-01	±0.0e+00	±0.0e+00	±1.6e-01	±0.0e+00	±2.1e-01
Tes2	Tes3	Tes4	Thwld1	Thwld2	Tcyl	Talt	Tgr1	Tgr2
2.9390e+02	0.0000e+00	0.0000e+00	1.5125e+02	9.5581e+01	2.2318e+01	2.0560e+01	1.2198e+01	1.6206e+01
±1.8e-01	±0.0e+00	±0.0e+00	±1.2e-01	±4.1e-02	±2.4e-01	±8.3e-02	±1.0e-01	±1.3e-01

SPRE PC/TDAS Build 13, Report Date: Thu Jul 21 09:33:13 1994
 DataFile: 071393.dta ChanFile: chspre05 DATE: 07-13-93 TIME: 10:37:45
 Avg of 5 RdgNs: 25.*

STEADY STATE DATA

Tjrsrf	Tsesrf	Tsbsrf	Tesrf1	Tesrf2	Tesrf3	Tghr1	Tghr2	Tghr3
2.1132e+01	2.2933e+02	4.8780e+01	2.7565e+02	2.5142e+02	2.5050e+02	0.0000e+00	0.0000e+00	0.0000e+00
±1.6e-01	±2.3e-01	±1.2e-01	±1.5e-01	±1.4e-01	±1.4e-01	±0.0e+00	±0.0e+00	±0.0e+00
Tghr4	Tascyl	Tkman1	Tkman2	Tkman3	Tctws	Tctwr	Tcwei	Tcweo
0.0000e+00	-6.9285e+01	2.4388e+01	2.6105e+01	2.1918e+01	9.6366e+00	8.5159e+00	5.5720e+01	1.2351e+01
±0.0e+00	±1.6e-01	±9.0e-02	±1.1e-01	±1.5e-01	±2.0e-01	±2.3e-01	±1.2e-01	±9.6e-02
Tcwc	Tbrgr	Tdbrgs	Tpbrgs	Tsresa	Tsresb	Disz	Velx	Vely
1.2632e+01	2.1478e+01	3.0888e+01	3.8183e+01	3.0606e+02	3.0578e+02	0.0000e+00	1.1525e-02	1.5756e-03
±7.6e-02	±1.3e-01	±1.2e-01	±1.1e-01	±1.1e-01	±5.5e-02	±0.0e+00	±4.0e-05	±2.2e-05
Velz	Accx	Accy	Accz	Vsp	Mtrspd	Patm		
3.9687e-06	2.0762e-03	1.4771e-03	6.1255e-02	1.0705e+02	-1.5625e-01	1.0000e+05		
±1.1e-05	±4.8e-05	±3.8e-05	±2.0e-04	±3.5e-02	±4.3e-01	±0.0e+00		

CALCULATIONS, rev: clnspre

tehw	tecw	trtow	tehf	tecf	tcina	trtof	trtec*	pvpst
3.0229e+02	1.4303e+01	2.0019e+00	3.0401e+02	1.3760e+01	1.3760e+01	2.0117e+00	0.0000e+00	2.8384e+00
±2.1e-01	±1.2e-01	±1.2e-03	±1.7e-01	±1.3e-01	±1.3e-01	±1.1e-03	±0.0e+00	±3.4e-02
pwalt	pwacld	palts	etcno	etapvh	etapvc	etalt	etsys	dsfrq
2.4039e+00	2.3947e+00	2.6313e+00	5.0047e-01	2.3133e-01	2.1780e-01	9.1366e-01	1.9595e-01	5.7828e+01
±1.5e-02	±1.1e-02	±3.0e-02	±3.1e-04	±1.1e-02	±1.1e-02	±1.5e-02	±1.0e-02	±9.8e-02
xdrp	xdspet	vpa	vda	xca	xcph	pwads	pnads	akads
9.9702e-01	4.2355e-03	3.4855e+00	3.4751e+00	4.0519e-02	-1.7120e+02	1.1744e-01	1.4776e-01	2.6089e+05
±4.7e-03	±1.1e-05	±1.0e-02	±1.1e-02	±1.4e-04	±4.8e-02	±5.4e-03	±6.9e-03	±1.0e+03
cads	phads	pwfds	pnfds	akfds	cfds	phfds	pvpns	pwaps
1.9450e+01	1.8166e+02	7.3387e-02	9.2335e-02	2.7902e+04	1.2155e+01	1.8964e+02	3.5499e+00	1.9110e-01
±8.7e-01	±7.6e-02	±2.6e-03	±3.4e-03	±2.0e+02	±4.6e-01	±3.5e-01	±4.3e-02	±6.4e-03
pnaps	akaps	caps	phaps	pci*	pcphi*	pea*	peph*	dpa*
2.3902e-01	3.4889e+05	3.1464e+01	1.8201e+02	1.6633e-01	-1.6548e+02	5.1747e-01	-1.4374e+01	3.1086e-02
±8.4e-03	±9.4e+02	±1.2e+00	±7.8e-02	±6.6e-04	±8.0e-02	±1.7e-03	±1.4e-01	±5.0e-04
dpph*	pcpm	pratio	dtslt*	qeh1	qec1	qac	dtffh	fleh
7.1810e+01	1.0376e-01	1.2315e+00	0.0000e+00	1.2283e+01	1.0211e+01	3.9107e-01	1.7211e+00	1.2009e+00
±4.0e-01	±4.8e-04	±1.2e-03	±0.0e+00	±5.7e-01	±6.6e-01	±1.6e-02	±8.0e-02	±8.8e-04
dpehm	pwrehm	dpecm	pwrecm	qbleng	qblalt	qblsys	dtffc	tqin*
1.1314e+02	1.3587e-01	5.6142e+01	6.6621e-02	1.0627e+00	9.8483e-01	1.0592e+00	5.4261e-01	9.1765e+00
±1.7e-01	±3.1e-04	±4.4e-01	±7.8e-04	±4.2e-02	±2.0e-02	±4.2e-02	±3.5e-02	±8.0e-03
tqrj*	pwrfcd	pwrfcp	pwdrd	pwtds	pwmp	falta	faltph	balte
6.1645e+00	-2.3305e+00	1.2122e+01	1.7358e-01	1.9083e-01	-1.2625e-03	1.3176e+07	-6.9610e-04	4.4974e+01
±3.5e-02	±3.4e-02	±3.9e-02	±1.5e-04	±3.0e-03	±3.1e-03	±4.6e+04	±3.6e-06	±3.0e-01
paltis	cap	aind	baltm	pwdcas	pwmpn	prwpm	rhosit	cpslt
2.2740e-01	7.8235e+02	8.4913e+00	4.2955e+05	1.5984e-02	-1.5892e-03	1.1786e-02	1.8610e+00	1.5630e+00
±4.1e-02	±4.5e+00	±1.0e-01	±2.1e+03	±3.7e-05	±3.9e-03	±3.6e-05	±1.3e-04	±0.0e+00
muslt	rhoel	cpcl	mucl	prncl				
3.1152e+00	1.0011e+00	4.1959e+00	1.2066e+00	8.1474e+00				
±3.8e-03	±2.1e-05	±1.3e-04	±3.9e-03	±3.3e-02				

CONSTANTS

DROD	DFDS	DADS	DPST	DDISP	MDISP	MPST	MCASE	AKMAG
4.5720e-02	8.5126e-02	8.3666e-02	1.4478e-01	1.1414e-01	1.6789e+00	9.7420e+00	2.2930e+03	1.3290e-05
ehm	ecm	apist	aads	afds	arod			
2.2727e-02	2.2727e-02	1.6463e-02	3.8561e-03	4.0496e-03	1.9355e-04			

SPRE PC/TDAS Build 13, Report Date: Thu Jul 21 09:06:25 1994
 DataFile: 071393.dta ChanFile: chspre05 DATE: 07-13-93 TIME: 10:44:49
 Avg of 5 RdgNs: 29.*

DYNAMIC DATA, ncyc: 4, nsam: 257

No,	Name,	Mean,	Amplitude,	Phase,	THD,	RMS
1	Xp	-1.9355e+00	8.8829e+00	0.000	2.0362e-02	6.2825e+00
	90%.cl	±3.7e-02	±9.9e-03	±0.000	±3.0e-03	±6.9e-03
2	Xd	1.0106e+00	8.9820e+00	69.597	2.0292e-02	6.3525e+00
	90%.cl	±7.0e-02	±2.9e-02	±0.349	±2.5e-03	±2.1e-02
3	Pcs	1.7822e-02	5.1273e-01	-11.321	5.6659e-02	3.6314e-01
	90%.cl	±6.8e-03	±1.8e-03	±0.106	±3.3e-03	±1.2e-03
4	Pes	-4.7185e-03	5.1234e-01	-13.847	6.0342e-02	3.6294e-01
	90%.cl	±5.6e-03	±2.9e-03	±0.177	±4.0e-03	±2.1e-03
5	Padgs	-5.7038e-02	6.1151e-01	71.289	6.2853e-02	4.3326e-01
	90%.cl	±8.0e-03	±1.5e-03	±0.265	±3.4e-03	±1.1e-03
6	Ppgs	1.2036e-02	1.8870e-01	-177.950	1.8302e-02	1.3346e-01
	90%.cl	±7.1e-03	±5.2e-04	±0.028	±2.1e-03	±3.7e-04
7	Pfdgs	1.3144e-02	6.3493e-02	-101.407	4.0861e-02	4.4934e-02
	90%.cl	±3.2e-03	±4.8e-04	±0.919	±7.0e-03	±3.3e-04
8	Ialt	1.4310e-02	3.1268e+01	84.925	4.1113e-02	2.2128e+01
	90%.cl	±5.9e-02	±7.4e-02	±0.152	±2.2e-03	±5.3e-02
9	Valt	1.3050e-01	1.7974e+02	55.130	3.3099e-02	1.2716e+02
	90%.cl	±3.7e-01	±2.1e-01	±0.169	±2.3e-03	±1.5e-01
10	Vacld	5.3006e-02	1.5565e+02	89.763	3.6642e-02	1.1014e+02
	90%.cl	±3.2e-01	±1.8e-01	±0.145	±2.2e-03	±1.3e-01
11	Vcap	1.6063e-01	1.0151e+02	-5.586	2.2944e-02	7.1797e+01
	90%.cl	±2.6e-01	±2.5e-01	±0.024	±2.8e-03	±1.8e-01
12	Iaux	2.8119e-03	3.2109e+00	15.828	8.6435e-02	2.2789e+00
	90%.cl	±8.7e-03	±7.4e-03	±0.198	±3.2e-03	±4.9e-03

STEADY STATE DATA

Freque	Freq	Pmean	dPdbrg	dPpbrg	Perderr	Xpar	Xdar	Kwsmh
6.2387e+01	6.2353e+01	5.0455e+00	1.1622e+03	1.1870e+03	3.3462e-01	8.8673e-03	8.8233e-04	1.6875e+01
±5.8e-02	±4.3e-02	±5.3e-03	±3.0e+00	±3.9e+00	±6.1e-04	±7.1e-06	±2.0e-06	±8.8e+00
Kwssh	Kwalt	KwalTB	Kwlddc	Kwalts	Fleh	Flec	Flac	Flcwt
-1.0652e-02	2.4369e+00	2.4285e+00	2.4134e+00	-2.4805e-03	1.1867e+00	1.1332e+00	5.2969e-02	1.1782e+00
±4.9e-03	±3.2e-03	±2.9e-02	±3.5e-03	±1.7e-03	±2.9e-03	±2.3e-02	±1.2e-03	±2.3e-02
Tzero	Toven2	Toven3	Toven4	Tehi	Tehid	dTeha	dTeh	Teho
0.0000e+00	6.6025e+01	6.5261e+01	6.4840e+01	3.0614e+02	3.0609e+02	-3.5317e+00	-2.9439e+00	3.0252e+00
±0.0e+00	±4.4e-02	±5.8e-02	±8.1e-02	±1.7e-01	±6.7e-02	±1.1e-01	±1.3e-01	±9.3e-02
Tehod	Teci	Tecid	dTeca	dTec	Teco	Tecod	Taci	dTac
3.0283e+02	1.1530e+01	1.1016e+01	2.1325e+00	2.0859e+00	1.4247e+01	1.2915e+01	1.2749e+01	1.9389e+00
±1.1e-01	±8.4e-02	±5.8e-02	±9.8e-02	±1.1e-01	±1.1e-01	±1.5e-01	±1.1e-01	±8.8e-02
Taco	Tcwl	dTcwl	dTcwl	dTectp	dPdbf	dPpbf	Peci	Peco
1.4482e+01	1.3316e+01	6.7244e-01	0.0000e+00	1.9234e-03	1.2551e+03	1.8280e+03	2.3591e+02	1.3392e+02
±1.3e-01	±8.1e-02	±7.4e-02	±0.0e+00	±2.7e-05	±1.0e+00	±1.9e+01	±1.0e+01	±6.3e+00
Paci	Paco	Pcpwi	Pspair	Pdbrgs	Ppbrgs	Pbrgri	Pstreg	dPcwp
0.0000e+00	1.0904e+02	-2.3899e+01	-2.0033e-02	6.0401e+00	6.0808e+00	4.8962e+00	1.6059e+01	5.2113e+05
±0.0e+00	±5.8e+00	±1.3e+00	±1.6e-02	±5.1e-03	±1.7e-02	±6.8e-03	±7.0e-03	±2.2e+04
Vdc	Idc	Tcs1	Tcs2	Tfdgs	Tadgs	Tpgs1	Tpgs2	Tes1
1.0944e-01	0.0000e+00	0.0000e+00	1.2230e+01	0.0000e+00	0.0000e+00	2.2764e+01	0.0000e+00	2.9130e+02
±8.1e-05	±0.0e+00	±0.0e+00	±1.0e-01	±0.0e+00	±0.0e+00	±1.5e-01	±0.0e+00	±1.3e-01
Tes2	Tes3	Tes4	Thwld1	Thwld2	Tcyl	Talt	Tgcr1	Tgcr2
2.9424e+02	0.0000e+00	0.0000e+00	1.4767e+02	9.3880e+01	2.2149e+01	2.0497e+01	1.1011e+01	1.5088e+01
±8.4e-02	±0.0e+00	±0.0e+00	±8.6e-02	±1.2e-01	±1.7e-01	±1.8e-01	±5.6e-02	±1.1e-01

STEADY STATE DATA

Tjrsrf	Tsesrf	Tsbsrf	Tesrf1	Tesrf2	Tesrf3	Tghr1	Tghr2	Tghr3
2.1064e+01	2.3207e+02	4.9275e+01	2.7681e+02	2.5344e+02	2.5378e+02	0.0000e+00	0.0000e+00	0.0000e+00
±1.5e-01	±2.6e-01	±1.4e-01	±1.5e-01	±2.0e-01	±1.6e-01	±0.0e+00	±0.0e+00	±0.0e+00
Tghr4	Tascyl	Tkman1	Tkman2	Tkman3	Tctws	Tctwr	Tcwhei	Tcwheo
0.0000e+00	-6.9249e+01	2.4367e+01	2.6051e+01	2.1857e+01	8.4205e+00	7.4266e+00	5.6190e+01	1.0945e+01
±0.0e+00	±1.3e-01	±6.4e-02	±9.0e-02	±1.4e-01	±6.7e-02	±5.9e-02	±7.5e-02	±7.0e-02
Tcwc	Tbrgr	Tdbrgs	Tpbrgs	Tsresa	Tsresb	Disz	Velx	Vely
1.1515e+01	2.1261e+01	3.1112e+01	3.8147e+01	3.0586e+02	3.0567e+02	0.0000e+00	1.1494e-02	1.6510e-03
±5.7e-02	±6.9e-02	±8.0e-02	±9.6e-02	±1.4e-01	±1.5e-01	±0.0e+00	±3.2e-05	±1.1e-05
Velz	Accx	Accy	Accz	Vsp	Mtrspd	Patm		
3.9687e-06	2.2876e-03	1.9597e-03	6.1548e-02	1.0630e+02	1.0938e+01	1.0000e+05		
±2.7e-05	±2.3e-05	±6.4e-05	±3.1e-05	±3.5e-02	±1.9e+01	±0.0e+00		

CALCULATIONS, rev: cinspre

tehw	tecw	trtow	tehf	tecf	tclna	trtof	trtec*	pvpst
3.0263e+02	1.3136e+01	2.0112e+00	3.0437e+02	1.2597e+01	1.2597e+01	2.0211e+00	0.0000e+00	2.8848e+00
±2.1e-01	±1.0e-01	±1.0e-03	±1.8e-01	±9.4e-02	±9.4e-02	±9.7e-04	±0.0e+00	±1.9e-02
pwalt	pwacld	palts	etcno	etapvh	etapvc	etal	etsys	dsfrq
2.4385e+00	2.4248e+00	2.6753e+00	5.0278e-01	2.3180e-01	2.2138e-01	9.1151e-01	1.9592e-01	5.7997e+01
±6.6e-03	±7.3e-03	±1.7e-02	±2.5e-04	±7.9e-03	±8.0e-03	±6.0e-03	±5.6e-03	±3.1e-02
xdrp	xdspet	vpa	vda	xca	xcph	pwads	pnads	akads
1.0112e+00	4.2326e-03	3.4820e+00	3.5208e+00	4.0504e-02	-1.7125e+02	1.2260e-01	1.5194e-01	2.6241e+05
±3.3e-03	±8.2e-06	±6.6e-03	±1.4e-02	±7.2e-05	±2.1e-02	±7.4e-03	±8.3e-03	±3.3e+02
cads	phads	pwfds	pnfds	akfds	cfds	phfds	pvpns	pwaps
1.9776e+01	1.8169e+02	7.0765e-02	8.7733e-02	2.8273e+04	1.1420e+01	1.8900e+02	3.6560e+00	1.9347e-01
±1.1e+00	±9.2e-02	±4.2e-03	±5.8e-03	±2.0e+02	±7.7e-01	±5.9e-01	±3.1e-02	±2.2e-03
pnaps	akaps	caps	phaps	pci*	pcphi*	pea*	peph*	dpa*
2.4519e-01	3.4950e+05	3.1915e+01	1.8205e+02	1.6703e-01	-1.6555e+02	5.0905e-01	-1.4745e+01	3.0749e-02
±3.2e-03	±6.7e+02	±4.3e-01	±2.8e-02	±3.8e-04	±4.3e-02	±1.7e-03	±1.1e-01	±4.0e-04
dpph*	pcpm	pratio	dtslt*	qeh1	qec1	qac	dtffh	fleh
7.0094e+01	1.0162e-01	1.2262e+00	0.0000e+00	1.2452e+01	1.0155e+01	4.3173e-01	1.7462e+00	1.1992e+00
±7.0e-02	±4.1e-04	±1.0e-03	±0.0e+00	±3.8e-01	±4.7e-01	±2.6e-02	±5.4e-02	±2.9e-03
dpehm	pwrehm	dpecm	pwrecm	qbleng	qblalt	qblsys	dtffc	tqin*
1.1279e+02	1.3526e-01	5.1313e+01	5.8174e-02	1.0475e+00	9.9497e-01	1.0464e+00	5.3965e-01	9.1197e+00
±5.6e-01	±1.0e-03	±2.0e+00	±3.4e-03	±4.4e-02	±9.6e-03	±4.4e-02	±2.5e-02	±7.7e-03
tqrj*	pwrfcd	pwrfcp	pwdrd	pwtds	pwmp	falta	faltph	balte
6.0624e+00	-2.3697e+00	1.2053e+01	1.7251e-01	1.9337e-01	-4.7932e-03	1.3237e+07	-6.9704e-04	4.4972e+01
±2.3e-02	±1.6e-02	±3.4e-02	±1.5e-04	±3.5e-03	±3.4e-03	±3.7e+04	±1.6e-06	±6.7e-02
palts	cap	aind	baltn	pwdcas	pwmpn	prwprn	rhoslt	cpslt
2.3677e-01	7.8581e+02	8.4169e+00	4.2334e+05	1.6063e-02	-5.9305e-03	1.1835e-02	1.8607e+00	1.5630e+00
±1.7e-02	±1.5e+00	±4.1e-02	±1.1e+03	±6.8e-05	±4.2e-03	±2.9e-05	±1.4e-04	±0.0e+00
muslt	rhocl	cpcl	mucl	prncl				
3.1074e+00	1.0013e+00	4.1971e+00	1.2428e+00	8.4596e+00				
±3.9e-03	±1.5e-05	±1.0e-04	±3.0e-03	±2.6e-02				

CONSTANTS

DROD	DFDS	DADS	DPIS	DDISP	MDISP	MPIS	MCASE	AKMAG
4.5720e-02	8.5126e-02	8.3666e-02	1.4478e-01	1.1414e-01	1.6789e+00	9.7420e+00	2.2930e+03	1.3290e-05
ehm	ecm	apist	aads	afds	arod			
2.2727e-02	2.2727e-02	1.6463e-02	3.8561e-03	4.0496e-03	1.9355e-04			

SPRE PC/TDAS Build 13, Report Date: Fri Jul 15 14:14:00 1994
 DataFile: 111893.dta ChanFile: chspre05 DATE: 11-18-93 TIME: 10:41:51
 Avg of 5 RdgNs: 18.*

DYNAMIC DATA, ncyc: 4, nsam: 257

No.	Name	Mean	Amplitude	Phase	THD	RMS
1	Xp	-1.9308e+00	8.0085e+00	0.000	3.5459e-02	5.6666e+00
	90%.cl	±3.6e-02	±2.1e-02	±0.000	±9.6e-03	±1.6e-02
2	Xd	1.1444e+00	8.1803e+00	72.304	3.5608e-02	5.7881e+00
	90%.cl	±7.1e-02	±2.5e-02	±0.371	±8.7e-03	±1.8e-02
3	Pcs	5.9926e-02	4.7047e-01	-11.611	5.9902e-02	3.3327e-01
	90%.cl	±2.2e-02	±2.7e-03	±0.240	±5.9e-03	±1.9e-03
4	Pes	3.8421e-03	4.7477e-01	-14.254	6.2474e-02	3.3637e-01
	90%.cl	±2.0e-02	±4.8e-03	±0.496	±4.9e-03	±3.4e-03
5	Padgs	3.4134e-02	5.5926e-01	73.868	6.5577e-02	3.9631e-01
	90%.cl	±1.7e-02	±2.4e-03	±0.347	±7.4e-03	±1.6e-03
6	Ppgs	5.7366e-02	1.6899e-01	-177.966	3.5252e-02	1.1957e-01
	90%.cl	±1.7e-02	±4.9e-04	±0.041	±9.5e-03	±3.3e-04
7	Pfdgs	5.5377e-02	5.7263e-02	-98.541	4.7159e-02	4.0538e-02
	90%.cl	±1.8e-02	±7.2e-04	±0.935	±1.3e-02	±5.0e-04
8	Ialt	1.2101e-01	2.9048e+01	90.549	4.5837e-02	2.0562e+01
	90%.cl	±1.0e-01	±1.6e-01	±0.220	±8.1e-03	±1.1e-01
9	Valt	3.1256e-01	1.7094e+02	56.044	4.2042e-02	1.2098e+02
	90%.cl	±6.2e-01	±5.3e-01	±0.222	±8.1e-03	±3.5e-01
10	Vacld	1.5773e-01	1.4178e+02	89.678	4.4811e-02	1.0036e+02
	90%.cl	±6.7e-01	±4.7e-01	±0.232	±8.3e-03	±3.1e-01
11	Vcap	2.3410e-01	9.4694e+01	-0.060	3.6598e-02	6.7005e+01
	90%.cl	±4.5e-01	±4.3e-01	±0.085	±9.7e-03	±3.0e-01
12	Iaux	9.1956e-04	0.0000e+00	0.000	0.0000e+00	3.0940e-03
	90%.cl	±2.0e-04	±0.0e+00	±0.000	±0.0e+00	±2.2e-04

STEADY STATE DATA

Freque	Freq	Pmean	dPdbrg	dPpbrg	Perderr	Xpar	Xdar	Kwsmh
6.2214e+01	6.2498e+01	5.0378e+00	1.1488e+03	1.1859e+03	3.3645e-01	8.0001e-03	8.0366e-04	-1.0654e-02
±1.2e-01	±1.1e-01	±1.2e-02	±2.3e+01	±1.9e+01	±1.3e-03	±1.0e-05	±1.9e-06	±2.0e-02
Kwssh	Kwalt	Kwaltb	Kwlddc	Kwalts	Fleh	Flec	Flac	Flcwt
-1.7754e-02	2.0884e+00	2.0301e+00	2.0666e+00	-9.3018e-04	1.1869e+00	1.1764e+00	5.5431e-02	1.2154e+00
±7.8e-03	±6.5e-03	±3.1e-02	±6.4e-03	±7.3e-03	±9.6e-03	±1.6e-02	±6.5e-04	±1.8e-02
Tzero	Toven2	Toven3	Toven4	Tehi	Tehid	dTeha	dTeh	Teho
0.0000e+00	6.6142e+01	6.5237e+01	6.4910e+01	3.1531e+02	3.1510e+02	-2.9889e+00	-2.5214e+00	3.1199e+02
±0.0e+00	±5.5e-02	±7.2e-02	±9.6e-02	±2.2e-01	±1.5e-01	±1.3e-01	±8.4e-02	±7.3e-02
Tehod	Teci	Tecid	dTeca	dTec	Teco	Tecod	Taci	dTac
3.1234e+02	1.7926e+01	1.7305e+01	1.7369e+00	1.7014e+00	2.0252e+01	1.8832e+01	1.8655e+01	7.2206e-01
±7.3e-02	±1.5e-01	±5.7e-02	±1.3e-01	±1.0e-01	±1.5e-01	±1.1e-01	±1.5e-01	±5.5e-02
Taco	Tcwl	dTcwl	dTcwl	dTectp	dPdbf	dPbfg	Peci	Peco
1.9153e+01	1.8428e+01	4.5001e-01	0.0000e+00	1.5321e-03	1.2535e+03	1.7788e+03	2.4778e+02	1.3705e+02
±2.2e-01	±8.7e-02	±4.5e-02	±0.0e+00	±2.0e-05	±4.5e+00	±1.2e+01	±6.7e+00	±4.0e+00
Paci	Paco	Pcpwi	Pspair	Pdbrgs	Ppbrgs	Pbrgri	Pstreg	dPcwp
0.0000e+00	1.1178e+02	1.3206e-01	2.5361e+01	6.0325e+00	6.0656e+00	4.8750e+00	1.4924e+01	4.5715e+02
±0.0e+00	±3.0e+00	±1.0e-01	±1.6e-02	±9.8e-03	±8.4e-03	±1.1e-02	±2.2e+00	±1.3e+02
Vdc	Idc	Tcs1	Tcs2	Tfdgs	Tadgs	Tpgs1	Tpgs2	Tes1
9.9906e-02	0.0000e+00	0.0000e+00	1.7168e+01	0.0000e+00	0.0000e+00	2.6149e+01	0.0000e+00	3.0212e+02
±8.1e-05	±0.0e+00	±0.0e+00	±1.5e-01	±0.0e+00	±0.0e+00	±1.9e-01	±0.0e+00	±1.0e-01
Tes2	Tes3	Tes4	Thwld1	Thwld2	Tcyl	Talt	Tgcr1	Tgcr2
3.0238e+02	0.0000e+00	0.0000e+00	1.0529e+02	7.8787e-01	2.5578e+01	2.4538e+01	1.7246e+01	2.0771e+01
±1.3e-01	±0.0e+00	±0.0e+00	±1.8e-01	±9.6e-02	±1.6e-01	±3.2e-01	±1.4e-01	±6.4e-02

STEADY STATE DATA

Tjrsrf	Tsesrf	Tsbsrf	Tesrf1	Tesrf2	Tesrf3	Tghr1	Tghr2	Tghr3
2.4193e+01	2.2680e+02	4.3457e+01	2.8164e+02	2.5109e+02	2.4846e+02	0.0000e+00	0.0000e+00	0.0000e+00
±1.9e-01	±1.1e-01	±6.9e-02	±1.3e-01	±1.5e-01	±2.1e-01	±0.0e+00	±0.0e+00	±0.0e+00
Tghr4	Tascyl	Tkman1	Tkman2	Tkman3	Tctws	Tctwr	Tcwhei	Tcwheo
0.0000e+00	-6.9151e+01	2.1163e+01	2.5964e+01	2.0237e+01	6.3141e+00	5.2099e+00	5.0391e+01	9.0964e+00
±0.0e+00	±1.9e-01	±1.3e-01	±1.4e-01	±1.8e-01	±7.6e-02	±1.2e-01	±8.7e-02	±4.3e-01
Tcwc	Tbrgr	Tdbrgs	Tpbrgs	Tsresa	Tsresb	Disz	Velx	Vely
1.7793e+01	2.4700e+01	2.8293e+01	3.6636e+01	3.1515e+02	3.1491e+02	0.0000e+00	1.0398e-02	1.2343e-03
±1.3e-01	±9.4e-02	±9.5e-02	±1.5e-01	±1.3e-01	±1.2e-01	±0.0e+00	±5.5e-05	±2.7e-05
Velz	Accx	Accy	Accz	Vsp	Mtrspd	Patm		
7.9375e-06	1.7774e-03	1.5123e-03	6.1483e-02	9.7525e+01	-1.5625e-01	1.0000e+05		
±1.3e-05	±3.5e-05	±7.2e-05	±2.3e-04	±4.2e-02	±4.3e-01	±0.0e+00		

CALCULATIONS, rev: clnspre

tehw	tecw	trtow	tehf	tecf	tclna	trtof	trtec*	pvpst
3.1234e+02	1.9250e+01	2.0024e+00	3.1382e+02	1.8794e+01	1.8794e+01	2.0105e+00	0.0000e+00	2.4401e+00
±2.9e-01	±1.7e-01	±1.6e-03	±2.5e-01	±1.5e-01	±1.5e-01	±1.4e-03	±0.0e+00	±5.1e-02
pwalt	pwacld	palts	etcno	etapvh	etapvc	etalr	etsys	dsfrq
2.0460e+00	2.0590e+00	2.2723e+00	5.0059e-01	2.3211e-01	2.2221e-01	9.0056e-01	1.9466e-01	5.7953e+01
±1.8e-02	±1.7e-02	±4.8e-02	±4.0e-04	±1.2e-02	±1.7e-02	±1.6e-02	±1.1e-02	±6.8e-02
xdrp	xdspet	vpa	vda	xca	xcph	pwads	pnads	akads
1.0215e+00	3.9012e-03	3.1306e+00	3.1977e+00	3.6297e-02	-1.7096e+02	9.4088e-02	1.4058e-01	2.6353e+05
±4.6e-03	±1.1e-05	±8.7e-03	±1.5e-02	±1.1e-04	±3.9e-02	±7.2e-03	±1.0e-02	±1.0e+03
cads	phads	pwfds	pnfds	akfds	cfds	phfds	pvpns	pwaps
1.8399e+01	1.8156e+02	5.8964e-02	8.8129e-02	2.7985e+04	1.1535e+01	1.8915e+02	3.8046e+00	1.5453e-01
±1.3e+00	±1.1e-01	±4.5e-03	±7.1e-03	±3.2e+02	±9.4e-01	±7.7e-01	±7.9e-02	±3.2e-03
pnaps	akaps	caps	phaps	pci*	pcphi*	pea*	peph*	dpa*
2.4093e-01	3.4717e+05	3.1535e+01	1.8203e+02	1.4913e-01	-1.6507e+02	4.6796e-01	-1.5178e+01	2.9310e-02
±4.8e-03	±1.2e+03	±6.2e-01	±4.1e-02	±4.8e-04	±7.3e-02	±2.6e-03	±2.0e-01	±5.1e-04
dpph*	pcpm	pratio	dtslt*	qeh1	qec1	qac	dtffh	fleh
7.1705e+01	9.3388e-02	1.2060e+00	0.0000e+00	1.0526e+01	8.5677e+00	1.6779e-01	1.4755e+00	1.1998e+00
±4.6e-01	±5.8e-04	±1.4e-03	±0.0e+00	±5.4e-01	±7.2e-01	±1.3e-02	±6.9e-02	±9.7e-03
dpehm	pwrehm	dpecm	pwrecm	qbleng	qblalt	qblsys	dtffc	tqin*
1.1205e+02	1.3446e-01	5.4726e+01	6.4391e-02	1.0476e+00	9.0739e-01	1.0261e+00	4.5530e-01	7.6533e+00
±1.8e+00	±3.3e-03	±1.5e+00	±2.7e-03	±9.5e-02	±1.5e-02	±9.6e-02	±3.8e-02	±5.2e-02
tqrj*	pwrfcd	pwrfcp	pwdrd	pwtds	pwmp	falta	faltph	balte
5.0684e+00	-2.4119e+00	1.2171e+01	1.4477e-01	1.5305e-01	5.0137e-03	1.1868e+07	-7.1570e-04	4.5000e+01
±4.7e-02	±4.6e-02	±5.2e-02	±9.9e-04	±4.0e-03	±3.9e-03	±4.8e+04	±3.1e-06	±2.8e-01
paltis	cap	aind	balrm	pwdcas	pwmpn	prwprn	rhoslt	cpslt
2.2633e-01	7.8474e+02	8.4092e+00	4.0858e+05	1.3296e-02	7.5013e-03	9.7921e-03	1.8536e+00	1.5630e+00
±4.1e-02	±4.0e+00	±6.7e-02	±1.9e+03	±8.9e-05	±5.8e-03	±5.2e-05	±1.9e-04	±0.0e+00
muslt	rhoel	cpcl	mucl	prncl				
2.9133e+00	1.0002e+00	4.1910e+00	1.0680e+00	7.0252e+00				
±4.9e-03	±3.1e-05	±1.4e-04	±3.8e-03	±3.0e-02				

CONSTANTS

DROD	DFDS	DADS	DPIST	DDISP	MDISP	MPIST	MCASE	AKMAG
4.5720e-02	8.5126e-02	8.3666e-02	1.4478e-01	1.1414e-01	1.6789e+00	9.7420e+00	2.2930e+03	1.3290e-05
ehm	ecm	apist	aads	afds	arod			
2.2727e-02	2.2727e-02	1.6463e-02	3.8561e-03	4.0496e-03	1.9355e-04			

SPRE PC/TDAS Build 13, Report Date: Wed Jul 20 13:09:10 1994
 DataFile: 111893.dta ChanFile: chspre05 DATE: 11-18-93 TIME: 11:33:46
 Avg of 5 RdgNs: 32.*

DYNAMIC DATA, ncy: 4, nsam: 257

No,	Name,	Mean,	Amplitude,	Phase,	THD,	RMS
1	Xp	-2.0405e+00	8.8845e+00	0.000	6.4020e-02	6.2952e+00
	90%.cl	±6.5e-02	±4.0e-02	±0.000	±3.2e-03	±2.8e-02
2	Xd	1.1604e+00	8.8131e+00	71.940	6.3508e-02	6.2444e+00
	90%.cl	±9.3e-02	±5.3e-02	±0.338	±2.7e-03	±3.8e-02
3	Pcs	-2.3798e-02	5.1618e-01	-11.124	8.3703e-02	3.6627e-01
	90%.cl	±6.5e-03	±3.3e-03	±0.212	±4.6e-03	±2.3e-03
4	Pes	-2.6894e-03	5.2072e-01	-13.783	8.5040e-02	3.6953e-01
	90%.cl	±4.5e-03	±4.8e-03	±0.447	±5.3e-03	±3.4e-03
5	Padgs	-5.0313e-02	5.9935e-01	73.473	8.7341e-02	4.2542e-01
	90%.cl	±3.9e-03	±4.2e-03	±0.343	±5.9e-03	±3.0e-03
6	Ppgs	-4.6586e-02	1.8619e-01	-177.965	6.3034e-02	1.3192e-01
	90%.cl	±3.5e-03	±7.5e-04	±0.033	±3.2e-03	±5.4e-04
7	Pfdgs	-8.9457e-03	6.1365e-02	-98.761	6.9484e-02	4.3497e-02
	90%.cl	±4.6e-03	±6.3e-04	±0.499	±3.9e-03	±4.5e-04
8	Ialt	1.9466e-01	3.0392e+01	90.992	7.4014e-02	2.1550e+01
	90%.cl	±3.0e-01	±1.9e-01	±0.364	±5.8e-03	±1.3e-01
9	Valt	2.3007e-01	1.8455e+02	57.360	7.0220e-02	1.3082e+02
	90%.cl	±1.9e+00	±1.0e+00	±0.308	±5.3e-03	±7.1e-01
10	Vacld	2.3909e-01	1.5500e+02	90.098	7.3050e-02	1.0989e+02
	90%.cl	±1.5e+00	±9.0e-01	±0.365	±6.4e-03	±6.2e-01
11	Vcap	6.2029e-02	9.9804e+01	0.168	6.5681e-02	7.0725e+01
	90%.cl	±7.6e-01	±4.5e-01	±0.033	±3.9e-03	±3.2e-01
12	Iaux	1.1932e-03	0.0000e+00	0.000	0.0000e+00	3.3281e-03
	90%.cl	±2.0e-04	±0.0e+00	±0.000	±0.0e+00	±2.1e-04

STEADY STATE DATA

Freque	Freq	Pmean	dPdbrg	dPpbrg	Perderr	Xpar	Xdar	Kwsmh
6.1932e+01	6.2271e+01	5.0022e+00	1.1810e+03	1.1828e+03	3.3946e-01	8.8818e-03	8.6910e-04	-1.0654e-02
±3.8e-02	±4.4e-02	±3.1e-03	±2.9e+00	±2.2e+00	±4.1e-04	±2.4e-06	±2.0e-06	±1.2e-02
Kwssh	Kwalt	Kwaltb	Kwlddc	Kwalts	Fleh	Flec	Flac	Flcwt
-1.7754e-02	2.4106e+00	2.3680e+00	2.3878e+00	-1.8604e-03	1.1911e+00	1.2093e+00	5.6719e-02	1.2517e+00
±0.0e+00	±5.2e-03	±2.5e-02	±5.4e-03	±6.7e-03	±3.1e-03	±9.1e-03	±4.7e-04	±8.1e-03
Tzero	Toven2	Toven3	Toven4	Tehi	Tehid	dTeha	dTeh	Teho
0.0000e+00	6.6139e+01	6.5242e+01	6.4854e+01	3.1412e+02	3.1388e+02	-3.4391e+00	-3.0128e+00	3.1037e+02
±0.0e+00	±2.9e-02	±1.0e-01	±7.1e-02	±2.5e-01	±2.0e-01	±2.3e-01	±9.4e-02	±2.1e-01
Tehod	Teci	Tecid	dTeca	dTec	Teco	Tecod	Taci	dTac
3.1070e+02	1.7092e+01	1.6537e+01	1.8072e+00	1.7898e+00	1.9646e+01	1.8340e+01	1.7880e+01	2.1339e-01
±2.4e-01	±1.8e-01	±9.4e-02	±6.8e-02	±4.6e-02	±1.1e-01	±1.4e-01	±1.4e-01	±1.2e-01
Taco	Tcwl	dTcwl	dTcwl	dTectp	dPdbf	dPpbf	Peci	Peco
1.7735e+01	1.6613e+01	2.2747e-01	0.0000e+00	1.6841e-03	1.2580e+03	1.7786e+03	2.6177e+02	1.4617e+02
±6.3e-02	±1.1e-01	±6.2e-02	±0.0e+00	±1.7e-05	±4.6e+00	±7.4e+00	±2.6e+00	±1.9e+00
Paci	Paco	Pcwp	Pspair	Pdbrgs	Ppbrgs	Pbrgri	Pstreg	dPcwp
0.0000e+00	1.1876e+02	1.5032e-01	2.5120e+01	6.0225e+00	6.0248e+00	4.8340e+00	1.6081e+01	3.3526e+02
±0.0e+00	±7.8e-01	±6.2e-02	±2.9e-02	±6.1e-03	±1.3e-02	±8.0e-03	±2.5e-03	±6.8e+01
Vdc	Idc	Tcs1	Tcs2	Tfdgs	Tadgs	Tpgs1	Tpgs2	Tes1
1.0948e-01	0.0000e+00	0.0000e+00	1.6443e+01	0.0000e+00	0.0000e+00	2.3220e+01	0.0000e+00	2.9901e+02
±8.7e-05	±0.0e+00	±0.0e+00	±1.4e-01	±0.0e+00	±0.0e+00	±2.7e-01	±0.0e+00	±1.1e-01
Tes2	Tes3	Tes4	Thwld1	Thwld2	Tcyl	Talt	Tgcr1	Tgcr2
3.0022e+02	0.0000e+00	0.0000e+00	1.0490e+02	7.8543e+01	2.2373e+01	2.0985e+01	1.6485e+01	2.0403e+01
±2.6e-01	±0.0e+00	±0.0e+00	±2.0e-01	±9.2e-02	±2.6e-01	±2.3e-01	±1.1e-01	±1.7e-01

STEADY STATE DATA

Tjrsrf	Tsesrf	Tsbsrf	Tesrf1	Tesrf2	Tesrf3	Tghr1	Tghr2	Tghr3
2.1900e+01	2.3686e+02	4.5872e+01	2.8375e+02	2.5871e+02	2.5607e+02	0.0000e+00	0.0000e+00	0.0000e+00
±1.9e-01	±1.2e-01	±1.3e-01	±1.9e-01	±2.1e-01	±1.9e-01	±0.0e+00	±0.0e+00	±0.0e+00
Tghr4	Tascyl	Tkman1	Tkman2	Tkman3	Tctws	Tctwr	Tcwhei	Tcwheo
0.0000e+00	-6.9242e+01	2.0876e+01	2.4973e+01	2.0718e+01	5.3245e+00	5.2686e+00	5.1530e+01	8.7852e+00
±0.0e+00	±1.2e-01	±9.6e-02	±9.4e-02	±5.0e-02	±1.4e-01	±1.4e-01	±9.8e-02	±6.6e-02
Tcwc	Tbrgr	Tdbrgs	Tpbrgs	Tsresa	Tsresb	Disz	Velx	Vely
1.7235e+01	2.1928e+01	2.7295e+01	3.3749e+01	3.1400e+02	3.1357e+02	0.0000e+00	1.1561e-02	1.3930e-03
±1.2e-01	±8.6e-02	±1.0e-01	±1.4e-01	±1.5e-01	±2.0e-01	±0.0e+00	±6.9e-05	±2.1e-05
Velz	Accx	Accy	Accz	Vsp	Mtrspd	Patm		
1.1906e-05	1.8969e-03	1.4357e-03	6.1713e-02	1.0693e+02	-3.1250e-01	1.0000e+05		
±1.3e-05	±1.4e-05	±2.1e-05	±2.1e-04	±3.5e-02	±5.3e-01	±0.0e+00		

CALCULATIONS, rev: cinspre

tehw	tecw	trtow	tehf	tecf	tclna	trtof	trtec*	pvpst
3.1070e+02	1.8483e+01	2.0020e+00	3.1240e+02	1.7996e+01	1.7996e+01	2.0112e+00	0.0000e+00	2.8338e+00
±1.5e-01	±2.2e-01	±1.5e-03	±1.7e-01	±2.0e-01	±2.0e-01	±1.2e-03	±0.0e+00	±3.3e-02
pwalt	pwacld	palt	etcno	etapvh	etapvc	etalt	etsys	dsfrq
2.3350e+00	2.3551e+00	2.6301e+00	5.0050e-01	2.3393e-01	2.3630e-01	8.8790e-01	1.9274e-01	5.7748e+01
±3.6e-02	±2.8e-02	±3.2e-02	±3.8e-04	±1.5e-02	±7.5e-03	±1.8e-02	±1.2e-02	±1.8e-02
xdrp	xdspet	vpa	vda	xca	xcph	pwads	pnads	akads
9.9198e-01	4.1936e-03	3.4572e+00	3.4295e+00	4.0218e-02	-1.7123e+02	1.0603e-01	1.3653e-01	2.6214e+05
±9.8e-03	±2.2e-05	±1.5e-02	±2.2e-02	±1.6e-04	±7.8e-02	±6.6e-03	±8.9e-03	±6.5e+02
cads	phads	pwfds	pnfds	akfds	cfds	phfds	pvpns	pwaps
1.8033e+01	1.8153e+02	6.8839e-02	8.8634e-02	2.7827e+04	1.1707e+01	1.8930e+02	3.5903e+00	1.8810e-01
±1.2e+00	±1.0e-01	±3.1e-03	±4.1e-03	±3.2e+02	±5.4e-01	±4.7e-01	±6.3e-02	±1.7e-03
pnaps	akaps	caps	phaps	pci*	pcphi*	pea*	peph*	dpa*
2.3831e-01	3.4479e+05	3.1476e+01	1.8203e+02	1.6498e-01	-1.6551e+02	5.1266e-01	-1.4714e+01	3.2424e-02
±4.0e-03	±1.9e+02	±5.2e-01	±3.3e-02	±6.2e-04	±1.2e-01	±3.1e-03	±2.1e-01	±2.8e-04
dpph*	pcpm	pratio	dtslt*	qeh1	qec1	qac	dtffh	fleh
7.0849e+01	1.0319e-01	1.2301e+00	0.0000e+00	1.2139e+01	9.1637e+00	5.0755e-02	1.6984e+00	1.2040e+00
±5.1e-01	±6.5e-04	±1.6e-03	±0.0e+00	±7.7e-01	±3.4e-01	±2.8e-02	±1.1e-01	±3.1e-03
dpehm	pwrehm	dpecm	pwrecm	qbleng	qblalt	qblsys	dtffc	tqin*
1.1296e+02	1.3601e-01	5.7901e+01	7.0023e-02	9.8968e-01	8.4194e-01	9.5266e-01	4.8697e-01	8.9899e+00
±5.9e-01	±1.1e-03	±8.7e-01	±1.6e-03	±4.3e-02	±1.1e-02	±4.1e-02	±1.8e-02	±5.3e-02
tqrj*	pwrfcd	pwrfcp	pwdrd	pwtds	pwmp	falta	faltph	balte
5.9860e+00	-2.3759e+00	1.2127e+01	1.7005e-01	1.7487e-01	1.0826e-02	1.3047e+07	-6.9362e-04	4.4452e+01
±7.6e-02	±3.1e-02	±5.2e-02	±1.0e-03	±4.7e-03	±5.2e-03	±5.3e+04	±6.6e-06	±5.5e-01
paltls	cap	aind	baltm	pwdcas	pwmpn	prwprn	rhoslt	cpslt
2.9505e-01	7.8258e+02	8.4178e+00	4.2931e+05	1.5644e-02	1.3930e-02	1.1542e-02	1.8547e+00	1.5630e+00
±5.1e-02	±7.6e+00	±9.0e-02	±4.2e+03	±5.7e-05	±6.7e-03	±2.7e-05	±1.3e-04	±0.0e+00
muslt	rhocl	cpcl	mucl	prncl				
2.9413e+00	1.0003e+00	4.1918e+00	1.0880e+00	7.1822e+00				
±3.4e-03	±4.0e-05	±1.8e-04	±5.2e-03	±4.1e-02				

CONSTANTS

DROD	DFDS	DADS	DPIST	DDISP	MDISP	MPIST	MCASE	AKMAG
4.5720e-02	8.5126e-02	8.3666e-02	1.4478e-01	1.1414e-01	1.6789e+00	9.7420e+00	2.2930e+03	1.3290e-05
ehm	ecm	apist	aads	afds	arod			
2.2727e-02	2.2727e-02	1.6463e-02	3.8561e-03	4.0496e-03	1.9355e-04			

SPRE PC/TDAS Build 13, Report Date: Fri Jul 15 14:14:00 1994
 DataFile: 111893.dta ChanFile: chspre05 DATE: 11-18-93 TIME: 13:29:37
 Avg of 5 RdgNs: 58.*

DYNAMIC DATA, ncy: 4, nsam: 257

No,	Name,	Mean,	Amplitude,	Phase,	THD,	RMS
1	Xp	-1.1444e+00	7.9949e+00	0.000	8.7304e-02	5.6748e+00
	90%.cl	±1.1e-01	±5.5e-02	±0.000	±4.9e-03	±3.9e-02
2	Xd	2.6990e-02	9.0180e+00	75.806	8.7788e-02	6.4013e+00
	90%.cl	±2.3e-01	±7.3e-02	±0.831	±6.8e-03	±5.5e-02
3	Pcs	-3.4481e-02	1.1973e+00	-10.882	9.7014e-02	8.5057e-01
	90%.cl	±9.9e-03	±7.6e-03	±0.160	±5.4e-03	±5.1e-03
4	Pes	-6.3664e-04	1.2207e+00	-15.299	1.0009e-01	8.6750e-01
	90%.cl	±1.1e-02	±7.0e-03	±0.210	±5.5e-03	±4.7e-03
5	Pdgs	-1.0797e-01	1.5536e+00	77.128	1.0659e-01	1.1048e+00
	90%.cl	±4.4e-02	±9.2e-03	±0.855	±1.1e-02	±7.1e-03
6	Ppgs	-2.0113e-02	4.3150e-01	-178.381	8.7729e-02	3.0629e-01
	90%.cl	±1.2e-02	±3.1e-03	±0.052	±4.5e-03	±2.2e-03
7	Pfdgs	-4.8470e-02	1.6725e-01	-94.818	9.0103e-02	1.1874e-01
	90%.cl	±1.6e-02	±1.3e-03	±0.780	±6.2e-03	±9.3e-04
8	Ialt	3.4688e-01	6.5850e+01	88.441	8.8451e-02	4.6745e+01
	90%.cl	±8.3e-01	±5.2e-01	±0.368	±4.1e-03	±3.7e-01
9	Valt	1.3008e+00	3.7563e+02	30.906	8.7189e-02	2.6662e+02
	90%.cl	±4.7e+00	±2.5e+00	±0.452	±5.3e-03	±1.9e+00
10	Vacld	5.6938e-01	2.0407e+02	88.127	8.8343e-02	1.4486e+02
	90%.cl	±2.5e+00	±1.5e+00	±0.355	±4.2e-03	±1.1e+00
11	Vcap	7.9848e-01	3.1575e+02	-2.053	8.7343e-02	2.2412e+02
	90%.cl	±3.5e+00	±2.3e+00	±0.123	±4.6e-03	±1.7e+00
12	Iaux	1.2464e-03	0.0000e+00	0.000	0.0000e+00	3.4637e-03
	90%.cl	±3.1e-04	±0.0e+00	±0.000	±0.0e+00	±3.2e-04

STEADY STATE DATA

Freque	Freq	Pmean	dPdbrg	dPpbrg	Perderr	Xpar	Xdar	Kwsnh
9.4918e+01	9.5381e+01	1.2506e+01	1.1470e+03	1.2174e+03	3.4136e-01	8.0182e-03	8.9174e-04	3.6733e+01
±6.6e-02	±6.5e-02	±1.9e-02	±6.2e+00	±9.4e+00	±4.6e-04	±1.5e-05	±3.9e-06	±1.8e-02
Kwssh	Kwalt	Kwaltr	Kwlddc	Kwalts	Fleh	Flec	Flac	Flcwt
-1.4203e-02	6.9412e+00	6.7874e+00	1.0299e+01	-3.1006e-03	1.1825e+00	1.2114e+00	5.6352e-02	1.2513e+00
±6.0e-03	±1.1e-02	±5.1e-02	±1.7e-02	±7.1e-03	±1.6e-03	±1.0e-02	±4.1e-04	±7.0e-03
Tzero	Toven2	Toven3	Toven4	Tehi	Tehid	dTeha	dTeh	Teho
0.0000e+00	6.6092e+01	6.5223e+01	6.4885e+01	3.4389e+02	3.4347e+02	-1.1003e+01	-1.0469e+01	3.3234e+02
±0.0e+00	±5.0e-02	±9.8e-02	±3.7e-02	±1.2e-01	±7.2e-02	±5.7e-02	±6.9e-02	±1.3e-01
Tehod	Teci	Tecid	dTeca	dTec	Teco	Tecod	Taci	dTac
3.3272e+02	2.5693e+01	2.5152e+01	5.8091e+00	5.8451e+00	3.2088e+01	3.0773e+01	2.6583e+01	4.4357e+00
±1.6e-01	±1.4e-01	±1.2e-01	±6.8e-02	±1.1e-01	±1.5e-01	±8.5e-02	±1.8e-01	±6.8e-02
Taco	Tcwl	dTcwl	dTcwl	dTectp	dPdbf	dPbfg	Peci	Peco
3.0767e+01	3.1185e+01	1.3116e+00	0.0000e+00	5.5637e-03	1.3234e+03	2.2262e+03	2.5687e+02	1.4200e+02
±9.5e-02	±7.8e-02	±6.9e-02	±0.0e+00	±2.4e-05	±1.8e+00	±2.4e+01	±2.9e+00	±2.0e+00
Paci	Paco	Pcwp	Pspair	Pdbrgs	Ppbrgs	Pbrgri	Pstreg	dPcwp
0.0000e+00	1.1597e+02	1.5032e-01	2.4581e+01	1.3507e+01	1.3579e+01	1.2315e+01	1.6005e+01	4.0839e+02
±0.0e+00	±1.3e+00	±6.2e-02	±3.5e-02	±3.9e-03	±3.9e-02	±2.8e-02	±6.2e-03	±1.4e+02
Vdc	Idc	Tcs1	Tcs2	Tfdgs	Tadgs	Tpgs1	Tpgs2	Tes1
1.4391e-01	0.0000e+00	0.0000e+00	3.1545e+01	0.0000e+00	0.0000e+00	3.9554e+01	0.0000e+00	3.2633e+02
±6.9e-05	±0.0e+00	±0.0e+00	±1.7e-01	±0.0e+00	±0.0e+00	±2.1e-01	±0.0e+00	±9.1e-02
Tes2	Tes3	Tes4	Thwld1	Thwld2	Tcyl	Talt	Tgrc1	Tgrc2
3.3722e+02	0.0000e+00	0.0000e+00	1.0469e+02	7.8691e+01	3.8694e+01	3.7767e+01	3.1253e+01	3.6364e+01
±1.0e-01	±0.0e+00	±0.0e+00	±1.8e-01	±7.8e-02	±2.1e-01	±1.5e-01	±1.6e-01	±8.8e-02

STEADY STATE DATA

Tjrsrf	Tsesrf	Tsbsrf	Tesrf1	Tesrf2	Tesrf3	Tghr1	Tghr2	Tghr3
3.4279e+01	2.6488e+02	4.9556e+01	3.1354e+02	2.9165e+02	2.9317e+02	0.0000e+00	0.0000e+00	0.0000e+00
±5.9e-01	±1.5e-01	±5.1e-02	±3.3e-01	±1.1e-01	±1.3e-01	±0.0e+00	±0.0e+00	±0.0e+00
Tghr4	Tascyl	Tkman1	Tkman2	Tkman3	Tctws	Tctwr	Tcwhei	Tcwheo
0.0000e+00	-6.9205e+01	2.0715e+01	2.5833e+01	2.0313e+01	8.5705e+00	5.2665e+00	5.0392e+01	1.4751e+01
±0.0e+00	±1.0e-01	±2.1e-02	±4.7e-02	±5.5e-02	±1.8e-01	±1.7e-01	±1.1e-01	±1.3e-01
Tcwc	Tbrgr	Tdbrgs	Tpbrgs	Tsresa	Tsresb	Disz	Velx	Vely
2.5959e+01	3.6503e+01	3.0902e+01	3.6026e+01	3.4319e+02	3.4305e+02	0.0000e+00	1.0112e-02	1.2660e-03
±1.3e-01	±1.5e-01	±1.4e-01	±2.4e-01	±1.2e-01	±2.0e-01	±0.0e+00	±1.3e-05	±1.1e-05
Velz	Accx	Accy	Accz	Vsp	Mtrspd	Patm		
2.3217e-03	6.4384e-03	6.0523e-03	-6.2737e-02	1.4062e+02	1.5625e-01	1.0000e+05		
±1.7e-05	±1.9e-04	±1.5e-04	±0.0e+00	±0.0e+00	±4.3e-01	±0.0e+00		

CALCULATIONS, rev: cinspre

tehw	tecw	trtow	tehf	tecf	tclna	trtof	trtec*	pvpst
3.3307e+02	3.0159e+01	1.9987e+00	3.3839e+02	2.8597e+01	2.8597e+01	2.0267e+00	0.0000e+00	8.8705e+00
±6.6e-02	±1.6e-01	±8.9e-04	±8.9e-02	±1.5e-01	±1.5e-01	±8.3e-04	±0.0e+00	±5.2e-02
pwalt	pwacld	palts	etcno	etapvh	etapvc	etalt	etsys	dsfrq
6.6389e+00	6.7191e+00	8.3392e+00	4.9967e-01	2.3411e-01	2.3192e-01	7.9613e-01	1.7522e-01	9.1310e+01
±1.2e-01	±1.0e-01	±5.0e-02	±2.2e-04	±2.2e-03	±1.8e-03	±1.6e-02	±3.8e-03	±7.0e-02
xdrp	xdspet	vpa	vda	xca	xcph	pwads	pnads	akads
1.1280e+00	4.3682e-03	4.7680e+00	5.3782e+00	3.6157e-02	-1.6980e+02	3.7160e-01	4.5713e-01	6.6414e+05
±1.5e-02	±3.4e-05	±3.4e-02	±4.6e-02	±2.8e-04	±1.4e-01	±2.2e-02	±3.3e-02	±2.6e+03
cads	phads	pwfds	pnfds	akfds	cfds	phfds	pvpns	pwaps
2.5706e+01	1.8132e+02	2.9668e-01	3.6485e-01	7.4101e+04	2.0516e+01	1.8938e+02	1.3879e+01	4.7850e-01
±1.9e+00	±9.3e-02	±3.6e-03	±7.1e-03	±4.3e+02	±4.1e-01	±1.9e-01	±2.2e-01	±8.8e-03
pnaps	akaps	caps	phaps	pci*	pcphi*	pea*	peph*	dpa*
7.4875e-01	8.8819e+05	4.2103e+01	1.8162e+02	1.4885e-01	-1.6321e+02	1.1964e+00	-1.6941e+01	1.2653e-01
±2.4e-02	±9.4e+02	±1.3e+00	±5.2e-02	±1.2e-03	±2.4e-01	±7.8e-03	±2.5e-01	±2.2e-03
dpph*	pcpm	pratio	dtslt*	qeh1	qec1	qac	dtffh	fleh
7.5697e+01	9.5733e-02	1.2117e+00	0.0000e+00	3.7891e+01	2.9378e+01	1.0436e+00	5.3205e+00	1.1964e+00
±9.8e-01	±5.6e-04	±1.4e-03	±0.0e+00	±1.8e-01	±1.4e-01	±1.9e-02	±2.6e-02	±1.6e-03
dpehm	pwrehm	dpecm	pwrecm	qbleng	qblalt	qblsys	dtffc	tqin*
1.0926e+02	1.3072e-01	5.7237e+01	6.9344e-02	1.0095e+00	8.6609e-01	9.7811e-01	1.5612e+00	3.2885e+01
±3.0e-01	±5.4e-04	±9.6e-01	±1.7e-03	±5.7e-03	±1.7e-02	±7.8e-03	±7.6e-03	±1.4e-01
tqrj*	pwrfcd	pwrfcp	pwdrd	pwtds	pwmp	falta	faltph	balte
2.3392e+01	-2.0673e+00	1.2331e+01	6.2205e-01	6.6828e-01	6.6482e-03	2.7579e+07	-8.0424e-04	4.2305e+01
±1.5e-01	±1.3e-02	±1.5e-02	±2.7e-03	±2.2e-02	±2.3e-02	±2.0e+05	±1.1e-05	±6.2e-01
paltls	cap	aind	baltn	pwdcas	pwmpn	prwprm	rhoslt	cpslt
1.7003e+00	3.4971e+02	8.2102e+00	4.1884e+05	5.2874e-02	8.0010e-03	4.1455e-02	1.8352e+00	1.5630e+00
±1.4e-01	±4.9e+00	±1.3e-01	±5.8e+03	±3.1e-04	±2.8e-02	±1.4e-04	±6.7e-05	±0.0e+00
muslt	rhocl	cpcl	mucl	prncl				
2.4845e+00	9.9788e-01	4.1838e+00	8.8161e-01	5.5395e+00				
±1.4e-03	±4.0e-05	±8.8e-05	±2.0e-03	±1.8e-02				

CONSTANTS

DROD	DFDS	DADS	DP1ST	DDISP	MDISP	MP1ST	MCASE	AKMAG
4.5720e-02	8.5126e-02	8.3666e-02	1.4478e-01	1.1414e-01	1.6789e+00	9.7420e+00	2.2930e+03	1.3290e-05
ehm	ecm	ap1st	aads	afds	arod			
2.2727e-02	2.2727e-02	1.6463e-02	3.8561e-03	4.0496e-03	1.9355e-04			

SPRE PC/TDAS Build 13, Report Date: Fri Jul 15 14:15:57 1994
 DataFile: 121793.dta ChanFile: chspre05 DATE: 12-17-93 TIME: 09:57:05
 Avg of 5 RdgNs: 13.*

DYNAMIC DATA, ncyc: 4, nsam: 257

No,	Name,	Mean,	Amplitude,	Phase,	TMD,	RMS
1	Xp	-2.0658e+00	7.9816e+00	0.000	3.5625e-02	5.6474e+00
	90%.cl	±5.7e-02	±2.2e-02	±0.000	±4.9e-03	±1.6e-02
2	Xd	1.2855e+00	8.0816e+00	72.958	3.5518e-02	5.7182e+00
	90%.cl	±6.3e-02	±1.9e-02	±0.306	±3.4e-03	±1.4e-02
3	Pcs	3.8033e-01	4.6810e-01	-10.795	6.1742e-02	3.3163e-01
	90%.cl	±5.0e-03	±5.3e-04	±0.104	±5.1e-03	±4.1e-04
4	Pes	-5.1678e-03	4.6850e-01	-13.441	6.3515e-02	3.3195e-01
	90%.cl	±2.1e-03	±7.8e-04	±0.241	±5.8e-03	±5.3e-04
5	Padgs	-4.0011e-02	5.5455e-01	74.593	6.5980e-02	3.9298e-01
	90%.cl	±9.6e-03	±7.0e-04	±0.286	±4.9e-03	±5.5e-04
6	Ppgs	4.3334e-04	1.6814e-01	179.562	3.3894e-02	1.1896e-01
	90%.cl	±2.5e-03	±3.4e-04	±0.111	±4.3e-03	±2.5e-04
7	Pfdgs	-8.7453e-03	5.7729e-02	-97.921	5.3397e-02	4.0880e-02
	90%.cl	±7.9e-03	±6.0e-04	±0.214	±8.4e-03	±4.1e-04
8	Ialt	2.8657e-02	2.6483e+01	90.585	4.7779e-02	1.8748e+01
	90%.cl	±9.2e-02	±7.1e-02	±0.155	±5.7e-03	±5.1e-02
9	Valt	-5.5101e-02	1.6700e+02	58.675	4.4347e-02	1.1821e+02
	90%.cl	±6.7e-01	±2.0e-01	±0.246	±5.7e-03	±1.3e-01
10	Vacl	1.1552e-01	1.4221e+02	89.761	4.6735e-02	1.0067e+02
	90%.cl	±5.0e-01	±4.5e-01	±0.158	±5.8e-03	±3.1e-01
11	Vcap	-8.6518e-02	9.1871e+01	-0.058	3.7089e-02	6.5008e+01
	90%.cl	±4.1e-01	±3.9e-01	±0.033	±5.3e-03	±2.8e-01
12	Iaux	1.1476e-03	0.0000e+00	0.000	0.0000e+00	3.7774e-03
	90%.cl	±1.5e-04	±0.0e+00	±0.000	±0.0e+00	±3.5e-04

STEADY STATE DATA

Freque	Freq	Pmean	dPdbrg	dPpbrg	Perderr	Xpar	Xdar	Kwsmh
6.2194e+01	6.2200e+01	5.0369e+00	1.1699e+03	1.2055e+03	3.3667e-01	7.9772e-03	7.9399e-04	3.9102e+01
±2.2e-02	±2.2e-02	±8.5e-03	±3.0e+00	±3.6e+00	±2.3e-04	±8.4e-06	±1.5e-06	±6.7e+00
Kwssh	Kwalt	Kwaltb	Kwlddc	Kwalts	Fleh	Flec	Flac	Flcwt
-5.3262e-03	1.9041e+00	1.8583e+00	1.8881e+00	-6.5112e-03	1.1950e+00	1.1751e+00	5.5997e-02	1.2177e+00
±6.0e-03	±1.7e-03	±2.3e-02	±1.7e-03	±3.7e-03	±1.1e-03	±4.3e-02	±2.1e-03	±4.8e-02
Tzero	Toven2	Toven3	Toven4	Tehi	Tehid	dTeha	dTeh	Teho
0.0000e+00	6.6150e+01	6.5234e+01	6.4904e+01	3.1425e+02	3.1397e+02	-3.2676e+00	-2.7443e+00	3.1074e+02
±0.0e+00	±7.9e-02	±7.7e-02	±1.2e-01	±2.2e-01	±1.2e-01	±1.5e-01	±1.6e-01	±2.0e-01
Tehod	Teci	Tecid	dTeca	dTec	Teco	Tecod	Taci	dTac
3.1107e+02	1.6349e+01	1.5813e+01	1.9647e+00	1.9391e+00	1.8987e+01	1.7625e+01	1.7461e+01	1.1587e+00
±3.0e-01	±1.5e-01	±4.2e-02	±5.4e-02	±1.3e-01	±7.2e-02	±1.7e-01	±1.4e-01	±1.1e-01
Taco	Tcwl	dTcwl	dTcwl	dTectp	dPdbf	dPbfg	Peci	Peco
1.8412e+01	1.7802e+01	4.0856e-01	0.0000e+00	1.7211e-03	1.2504e+03	1.7865e+03	2.4754e+02	1.3923e+02
±1.5e-01	±6.4e-02	±7.9e-02	±0.0e+00	±2.4e-05	±3.2e+00	±1.1e+01	±1.8e+01	±9.7e+00
Paci	Paco	Pcpwi	Pspair	Pdbrgs	Ppbrgs	Pbrgri	Pstreg	dPcwp
0.0000e+00	1.1304e+02	-2.5697e+01	2.4727e+01	6.0394e+00	6.0729e+00	4.9030e+00	1.6105e+01	5.3101e+05
±0.0e+00	±7.8e+00	±2.9e+00	±1.6e-02	±8.9e-03	±9.5e-03	±8.6e-03	±8.0e-03	±3.9e+04
Vdc	Idc	Tcs1	Tcs2	Tfdgs	Tadgs	Tpgs1	Tpgs2	Tes1
1.0012e-01	0.0000e+00	0.0000e+00	1.6124e+01	0.0000e+00	0.0000e+00	2.3130e+01	0.0000e+00	3.0015e+02
±5.3e-05	±0.0e+00	±0.0e+00	±1.5e-01	±0.0e+00	±0.0e+00	±1.8e-01	±0.0e+00	±7.3e-02
Tes2	Tes3	Tes4	Thwld1	Thwld2	Tcyl	Talt	Tgrc1	Tgrc2
3.0077e+02	0.0000e+00	0.0000e+00	1.0107e+02	7.7131e+01	2.2809e+01	2.1949e+01	1.5909e+01	1.9567e+01
±1.4e-01	±0.0e+00	±0.0e+00	±1.8e-01	±1.3e-01	±1.7e-01	±2.5e-01	±1.5e-01	±1.6e-01

STEADY STATE DATA

Tjrsrf	Tsesrf	Tsbsrf	Tesrf1	Tesrf2	Tesrf3	Tghr1	Tghr2	Tghr3
2.1428e+01	2.2125e+02	4.3788e+01	2.7699e+02	2.4490e+02	2.4352e+02	0.0000e+00	0.0000e+00	0.0000e+00
±1.9e-01	±8.7e-02	±1.0e-01	±1.3e-01	±1.9e-01	±1.5e-01	±0.0e+00	±0.0e+00	±0.0e+00
Tghr4	Tascyl	Tkman1	Tkman2	Tkman3	Tctws	Tctwr	Tcwhei	Tcwheo
0.0000e+00	-6.9134e+01	1.9937e+01	2.7401e+01	2.1694e+01	1.0480e+01	9.6413e+00	5.3351e+01	1.3266e+01
±0.0e+00	±1.8e-01	±1.4e-01	±1.6e-01	±7.6e-02	±9.4e-02	±1.1e-01	±9.3e-02	±1.3e-01
Tcmc	Tbrgr	Tdbrgs	Tpbrgs	Tsresa	Tsresb	Disz	Velx	Vely
1.6474e+01	2.2563e+01	2.6446e+01	3.4501e+01	3.1623e+02	3.1538e+02	0.0000e+00	1.0489e-02	9.2869e-04
±1.7e-01	±1.6e-01	±1.7e-01	±1.5e-01	±1.8e-01	±1.6e-01	±0.0e+00	±3.7e-05	±1.1e-05
Velz	Accx	Accy	Accz	Vsp	Mtrspd	Patm		
0.0000e+00	1.8157e-03	1.4878e-03	6.1304e-02	9.8113e+01	1.5625e-01	1.0000e+05		
±1.7e-05	±1.3e-05	±2.6e-05	±1.5e-04	±3.5e-02	±4.3e-01	±0.0e+00		

CALCULATIONS, rev: clnspre

tehw	tecw	trtow	tehf	tecf	tcina	trtof	trtec*	pvpst
3.1100e+02	1.7846e+01	2.0074e+00	3.1261e+02	1.7332e+01	1.7332e+01	2.0165e+00	0.0000e+00	2.2508e+00
±2.8e-01	±1.8e-01	±1.3e-03	±2.4e-01	±1.7e-01	±1.7e-01	±1.2e-03	±0.0e+00	±1.7e-02
pwalt	pwacld	palts	etcrno	etapvh	etapvc	etalt	etsys	dsfrq
1.8772e+00	1.8829e+00	2.2707e+00	5.0184e-01	1.9458e-01	1.8877e-01	8.2673e-01	1.6228e-01	5.7948e+01
±9.4e-03	±1.0e-02	±1.8e-02	±3.2e-04	±7.8e-03	±8.8e-03	±4.4e-03	±6.4e-03	±4.9e-02
xdrp	xdspet	vpa	vda	xca	xcph	pwads	pnads	akads
1.0125e+00	3.8776e-03	3.1190e+00	3.1581e+00	3.6091e-02	-1.7098e+02	9.6330e-02	1.4750e-01	2.6449e+05
±3.1e-03	±1.0e-05	±8.3e-03	±8.4e-03	±1.2e-04	±4.2e-02	±2.9e-03	±4.8e-03	±3.5e+02
cads	phads	pwfds	pnfds	akfds	cfds	phfds	pvpns	pwaps
1.9318e+01	1.8163e+02	5.8517e-02	8.9596e-02	2.8562e+04	1.1735e+01	1.8912e+02	3.5333e+00	-3.2996e-02
±6.4e-01	±5.2e-02	±5.0e-04	±8.2e-04	±3.1e+02	±1.1e-01	±1.6e-01	±4.1e-02	±8.5e-03
pnaps	akaps	caps	phaps	pci*	pcphi*	pea*	peph*	dpa*
-5.1762e-02	3.4680e+05	-6.7792e+00	5.3956e+02	1.4811e-01	-1.6506e+02	4.6575e-01	-1.4506e+01	3.0329e-02
±1.3e-02	±3.0e+02	±1.7e+00	±1.1e-01	±5.2e-04	±8.2e-02	±5.5e-04	±1.2e-01	±3.9e-04
dpph*	pcpm	pratio	dtslt*	qeh1	qec1	qac	dtffh	flehc
7.2900e+01	9.2934e-02	1.2049e+00	0.0000e+00	1.1578e+01	9.6856e+00	2.7241e-01	1.6169e+00	1.2079e+00
±3.3e-01	±1.8e-04	±4.3e-04	±0.0e+00	±5.1e-01	±5.4e-01	±3.2e-02	±7.2e-02	±1.1e-03
dpehm	pwrehm	dpecm	pwrecm	qbleng	qblalt	qblsys	dtffc	tqin*
1.1367e+02	1.3731e-01	5.4769e+01	6.4449e-02	1.0324e+00	9.5504e-01	1.0237e+00	5.1470e-01	7.5180e+00
±2.2e-01	±3.9e-04	±4.0e+00	±7.1e-03	±7.6e-02	±1.3e-02	±7.7e-02	±2.9e-02	±2.1e-02
tqrj*	pwrfcd	pwrfcp	pwdrd	pwtds	pwmp	falta	faltph	balte
5.1250e+00	-2.2527e+00	1.2106e+01	1.4221e-01	1.5485e-01	4.8954e-04	1.1821e+07	-7.1198e-04	4.5456e+01
±1.5e-02	±1.6e-02	±1.6e-02	±4.0e-04	±2.9e-03	±3.2e-03	±3.2e+04	±3.0e-06	±2.4e-01
paltls	cap	aind	baltm	pwdcas	pwmpn	prwprn	rhoslt	cpslt
3.9347e-01	7.3769e+02	8.3901e+00	4.4635e+05	1.3125e-02	7.4355e-04	9.6952e-03	1.8545e+00	1.5630e+00
±1.2e-02	±4.1e+00	±7.5e-02	±1.9e+03	±4.6e-05	±4.8e-03	±1.8e-05	±1.8e-04	±0.0e+00
muslt	rhocl	cpcl	mucl	prncl				
2.9370e+00	1.0005e+00	4.1924e+00	1.1053e+00	7.3181e+00				
±4.8e-03	±3.1e-05	±1.5e-04	±4.4e-03	±3.4e-02				

CONSTANTS

DROD	DFDS	DADS	DPIST	DDISP	MDISP	MPIST	MCASE	AKMAG
4.5720e-02	8.5126e-02	8.3666e-02	1.4478e-01	1.1414e-01	1.6789e+00	9.7420e+00	2.2930e+03	1.3290e-05
ehm	ecm	apist	aads	afds	arod			
2.2727e-02	2.2727e-02	1.6463e-02	3.8561e-03	4.0496e-03	1.9355e-04			

SPRE PC/TDAS Build 13, Report Date: Thu Jul 21 11:01:21 1994
 DataFile: 121793.dta ChanFile: chspre05 DATE: 12-17-93 TIME: 09:59:05
 Avg of 5 RdgNs: 14.*

DYNAMIC DATA, nyc: 4, nsam: 257

No,	Name,	Mean,	Amplitude,	Phase,	THD,	RMS
1	Xp	-2.1047e+00	8.8828e+00	0.000	6.5167e-02	6.2945e+00
	90%.cl	±5.1e-02	±3.4e-02	±0.000	±6.6e-03	±2.6e-02
2	Xd	1.1490e+00	8.7373e+00	71.965	6.4341e-02	6.1910e+00
	90%.cl	±1.3e-01	±3.6e-02	±0.739	±5.9e-03	±2.6e-02
3	Pcs	3.1881e-01	5.1505e-01	-10.074	8.3062e-02	3.6546e-01
	90%.cl	±3.4e-03	±1.3e-03	±0.183	±9.1e-03	±1.0e-03
4	Pes	-2.6239e-03	5.1606e-01	-12.530	8.3693e-02	3.6619e-01
	90%.cl	±3.7e-03	±1.3e-03	±0.326	±1.1e-02	±1.1e-03
5	Padgs	-6.6298e-02	5.9487e-01	73.566	8.6782e-02	4.2223e-01
	90%.cl	±9.8e-03	±2.0e-03	±0.775	±8.2e-03	±1.2e-03
6	Ppgs	-5.2511e-03	1.8591e-01	179.676	6.4067e-02	1.3173e-01
	90%.cl	±7.7e-04	±7.7e-04	±0.151	±4.7e-03	±5.7e-04
7	Pfdgs	-3.3065e-02	6.1228e-02	-98.396	7.1189e-02	4.3405e-02
	90%.cl	±6.7e-03	±6.7e-04	±0.625	±5.4e-03	±4.8e-04
8	Ialt	4.1576e-02	2.7655e+01	90.854	7.6907e-02	1.9613e+01
	90%.cl	±3.2e-01	±7.4e-02	±0.331	±5.2e-03	±4.9e-02
9	Valt	2.6326e-01	1.8043e+02	59.691	7.4242e-02	1.2794e+02
	90%.cl	±2.0e+00	±4.4e-01	±0.413	±5.9e-03	±3.3e-01
10	Vacld	2.0236e-01	1.5500e+02	90.035	7.5822e-02	1.0992e+02
	90%.cl	±1.8e+00	±6.2e-01	±0.340	±5.4e-03	±4.1e-01
11	Vcap	1.5274e-01	9.7099e+01	0.134	6.6775e-02	6.8813e+01
	90%.cl	±4.9e-01	±5.3e-01	±0.038	±7.0e-03	±4.0e-01
12	Iaux	1.2236e-03	0.0000e+00	0.000	0.0000e+00	3.4719e-03
	90%.cl	±1.0e-04	±0.0e+00	±0.000	±0.0e+00	±2.2e-04

STEADY STATE DATA

Freque	Freq	Pmean	dPdbrg	dPpbrg	Perderr	Xpar	Xdar	Kwsmh
6.1974e+01	6.1973e+01	4.9990e+00	1.1711e+03	1.1980e+03	3.3901e-01	8.8580e-03	8.6270e-04	3.6662e+01
±1.2e-02	±5.9e-02	±5.8e-03	±3.8e+00	±3.3e+00	±1.3e-04	±7.6e-06	±2.4e-06	±2.4e-02
Kwssh	Kwalt	Kwalb	Kwlddc	Kwalts	Fleh	Flec	Flac	Flcwt
-1.0652e-02	2.1888e+00	2.1818e+00	2.1697e+00	-6.2012e-04	1.1946e+00	1.2197e+00	5.8191e-02	1.2650e+00
±4.9e-03	±1.6e-03	±2.8e-02	±1.7e-03	±5.2e-03	±2.0e-03	±6.9e-03	±2.3e-04	±8.8e-04
Tzero	Toven2	Toven3	Toven4	Tehi	Tehid	dTeha	dTeh	Teho
0.0000e+00	6.6139e+01	6.5195e+01	6.4896e+01	3.1510e+02	3.1489e+02	-3.6645e+00	-3.1233e+00	3.1126e+02
±0.0e+00	±6.5e-02	±9.4e-02	±9.5e-02	±1.5e-01	±1.7e-01	±4.7e-02	±1.1e-01	±2.0e-01
Tehod	Teci	Tecid	dTeca	dTec	Teco	Tecod	Taci	dTac
3.1148e+02	1.6540e+01	1.6085e+01	2.1030e+00	2.0352e+00	1.9401e+01	1.8036e+01	1.7698e+01	1.1245e+00
±1.1e-01	±9.2e-02	±1.5e-01	±6.7e-02	±1.0e-01	±1.0e-01	±2.0e-01	±1.1e-01	±1.1e-01
Taco	Tcwli	dTcwl	dTcws1	dTectp	dPdbf	dPpbf	Peci	Peco
1.8564e+01	1.8107e+01	4.5666e-01	0.0000e+00	1.8810e-03	1.2474e+03	1.7970e+03	2.6637e+02	1.5011e+02
±1.2e-01	±9.7e-02	±1.0e-01	±0.0e+00	±1.4e-05	±3.6e+00	±2.0e+01	±1.8e+00	±4.4e-01
Paci	Paco	Pcpwi	Pspair	Pdbrgs	Ppbrgs	Pbrgri	Pstreg	dPcwp
0.0000e+00	1.2217e+02	-2.8489e+01	2.4828e+01	5.9991e+00	6.0365e+00	4.8613e+00	1.6061e+01	5.7173e+05
±0.0e+00	±4.8e-01	±3.1e-01	±4.7e-02	±5.6e-03	±8.5e-03	±6.8e-03	±4.0e-03	±2.4e+03
Vdc	Idc	Tcs1	Tcs2	Tfdgs	Tadgs	Tpgs1	Tpgs2	Tes1
1.0983e-01	0.0000e+00	0.0000e+00	1.6741e+01	0.0000e+00	0.0000e+00	2.4433e+01	0.0000e+00	2.9960e+02
±4.3e-05	±0.0e+00	±0.0e+00	±1.9e-01	±0.0e+00	±0.0e+00	±2.8e-01	±0.0e+00	±4.7e-02
Tes2	Tes3	Tes4	Thwld1	Thwld2	Tcyl	Talt	Tgr1	Tgr2
3.0135e+02	0.0000e+00	0.0000e+00	1.0111e+02	7.7240e+01	2.2992e+01	2.1982e+01	1.6167e+01	2.0129e+01
±1.5e-01	±0.0e+00	±0.0e+00	±1.2e-01	±1.6e-01	±2.5e-01	±9.6e-02	±1.1e-01	±9.3e-02

SPRE PC/TDAS Build 13, Report Date: Thu Jul 21 11:01:21 1994
 DataFile: 121793.dta ChanFile: chspre05 DATE: 12-17-93 TIME: 09:59:05
 Avg of 5 RdgNs: 14.*

STEADY STATE DATA

Tjrsrf	Tsesrf	Tsbsrf	Tesrf1	Tesrf2	Tesrf3	Tghr1	Tghr2	Tghr3
2.1434e+01	2.2335e+02	4.4075e+01	2.7751e+02	2.4662e+02	2.4602e+02	0.0000e+00	0.0000e+00	0.0000e+00
±1.6e-01	±2.4e-01	±1.4e-01	±1.7e-01	±1.5e-01	±2.4e-01	±0.0e+00	±0.0e+00	±0.0e+00
Tghr4	Tascyl	Tkman1	Tkman2	Tkman3	Tctws	Tctwr	Tcwhei	Tcwheo
0.0000e+00	-6.9103e+01	2.0010e+01	2.7279e+01	2.1818e+01	1.0531e+01	9.5481e+00	5.3462e+01	1.3399e+01
±0.0e+00	±1.8e-01	±8.1e-02	±1.3e-01	±1.5e-01	±1.3e-01	±1.2e-01	±1.5e-01	±2.4e-01
Tcwc	Tbrgr	Tdbrgs	Tpbrgs	Tsresa	Tsresb	Disz	Velx	Vely
1.6658e+01	2.2493e+01	2.6278e+01	3.4455e+01	3.1621e+02	3.1536e+02	0.0000e+00	1.1609e-02	1.0160e-03
±1.4e-01	±9.7e-02	±1.0e-01	±2.0e-01	±1.6e-01	±1.5e-01	±0.0e+00	±4.9e-05	±1.1e-05
Velz	Accx	Accy	Accz	Vsp	Mtrspd	Patm		
3.9687e-06	1.9658e-03	1.6242e-03	6.1188e-02	1.0751e+02	3.1250e-01	1.0000e+05		
±1.1e-05	±6.9e-05	±8.6e-05	±1.7e-04	±3.5e-02	±5.3e-01	±0.0e+00		

CALCULATIONS, rev: clnspre

tehw	tecw	trtow	tehf	tecf	tclna	trtof	trtec*	pvpst
3.1146e+02	1.8163e+01	2.0068e+00	3.1327e+02	1.7591e+01	1.7591e+01	2.0170e+00	0.0000e+00	2.5652e+00
±1.4e-01	±1.3e-01	±1.3e-03	±1.4e-01	±1.1e-01	±1.1e-01	±1.2e-03	±0.0e+00	±4.8e-02
pwalt	pwacld	palts	etcno	etapvh	etapvc	etalt	etsys	dsfrq
2.1349e+00	2.1430e+00	2.5796e+00	5.0170e-01	1.9793e-01	1.9264e-01	8.2769e-01	1.6473e-01	5.7729e+01
±1.3e-02	±1.4e-02	±3.7e-02	±3.2e-04	±4.1e-03	±7.8e-03	±1.3e-02	±2.0e-03	±3.3e-02
xdrp	xdspet	vpa	vda	xca	xcph	pwads	pnads	akads
9.8362e-01	4.1679e-03	3.4589e+00	3.4023e+00	4.0183e-02	-1.7129e+02	1.0898e-01	1.4277e-01	2.6244e+05
±4.9e-03	±1.3e-05	±1.4e-02	±1.4e-02	±2.1e-04	±6.6e-02	±3.1e-03	±5.2e-03	±8.1e+02
cads	phads	pwfds	pnfds	akfds	cfds	phfds	pvpns	pwaps
1.8832e+01	1.8160e+02	7.0643e-02	9.2525e-02	2.7977e+04	1.2204e+01	1.8964e+02	3.2510e+00	-2.9936e-02
±6.9e-01	±5.6e-02	±3.3e-03	±3.7e-03	±2.3e+02	±4.8e-01	±3.1e-01	±6.0e-02	±1.4e-02
pnaps	akaps	caps	phaps	pci*	pcphi*	pea*	peph*	dpa*
-3.7922e-02	3.4455e+05	-5.0021e+00	5.3968e+02	1.6479e-01	-1.6558e+02	5.1135e-01	-1.3669e+01	3.2406e-02
±1.8e-02	±2.5e+02	±2.3e+00	±1.5e-01	±1.0e-03	±1.2e-01	±1.4e-03	±2.1e-01	±6.0e-04
dpph*	pcpm	pratio	dtslt*	qeh1	qec1	qac	dtffh	fleh
7.1572e+01	1.0303e-01	1.2297e+00	0.0000e+00	1.2961e+01	1.0758e+01	2.7441e-01	1.8103e+00	1.2076e+00
±8.0e-01	±2.7e-04	±6.7e-04	±0.0e+00	±1.6e-01	±3.8e-01	±2.6e-02	±2.3e-02	±2.0e-03
dpehm	pwrehm	dpecm	pwrecm	qbleng	qblalt	qblsys	dtffc	tqin*
1.1355e+02	1.3712e-01	5.8937e+01	7.1886e-02	1.0281e+00	9.3941e-01	1.0161e+00	5.7168e-01	8.8783e+00
±3.9e-01	±7.0e-04	±6.6e-01	±1.2e-03	±3.4e-02	±2.2e-02	±3.6e-02	±2.0e-02	±2.8e-02
tqrj*	pwrfcd	pwrfcp	pwdrd	pwtds	pwmp	falta	faltph	balte
6.1452e+00	-2.1694e+00	1.2081e+01	1.6794e-01	1.7962e-01	3.8621e-03	1.3063e+07	-6.8785e-04	4.4642e+01
±2.2e-02	±3.8e-02	±2.4e-02	±5.2e-04	±1.3e-03	±1.2e-03	±5.5e+04	±4.4e-06	±3.2e-01
paltls	cap	aind	balrm	pwdcas	pwmpn	pwprn	rhoslt	cpslt
4.4472e-01	7.3142e+02	8.4568e+00	4.7236e+05	1.5540e-02	5.0550e-03	1.1470e-02	1.8540e+00	1.5630e+00
±4.0e-02	±5.9e+00	±1.3e-01	±3.2e+03	±4.1e-05	±1.6e-03	±2.0e-05	±1.1e-04	±0.0e+00
muslt	rhoct	cpcl	mucl	prncl				
2.9240e+00	1.0004e+00	4.1921e+00	1.0985e+00	7.2643e+00				
±2.8e-03	±2.2e-05	±1.1e-04	±3.0e-03	±2.3e-02				

CONSTANTS

DROD	DFDS	DADS	DPST	DDISP	MDISP	MPST	MCASE	AKMAG
4.5720e-02	8.5126e-02	8.3666e-02	1.4478e-01	1.1414e-01	1.6789e+00	9.7420e+00	2.2930e+03	1.3290e-05
ehm	ecm	apist	aads	afds	arod			
2.2727e-02	2.2727e-02	1.6463e-02	3.8561e-03	4.0496e-03	1.9355e-04			

SPRE PC/TDAS Build 13, Report Date: Thu Jul 21 11:01:21 1994
 DataFile: 121793.dta ChanFile: chspre05 DATE: 12-17-93 TIME: 10:07:27
 Avg of 5 RdgNs: 19.*

DYNAMIC DATA, ncy: 4, nsam: 257

No,	Name,	Mean,	Amplitude,	Phase,	THD,	RMS
1	Xp	-2.0849e+00	8.8723e+00	0.000	3.5579e-02	6.2776e+00
	90%.cl	±3.3e-02	±2.0e-02	±0.000	±4.1e-03	±1.5e-02
2	Xd	1.1475e+00	8.8154e+00	71.451	3.7453e-02	6.2378e+00
	90%.cl	±8.5e-02	±2.2e-02	±0.328	±3.3e-03	±1.6e-02
3	Pcs	2.7461e-01	5.1642e-01	-10.208	6.1901e-02	3.6586e-01
	90%.cl	±6.4e-03	±1.5e-03	±0.084	±3.2e-03	±1.1e-03
4	Pes	4.9255e-04	5.1770e-01	-12.792	6.3743e-02	3.6681e-01
	90%.cl	±1.6e-03	±2.4e-03	±0.184	±2.5e-03	±1.7e-03
5	Padgs	5.5019e-05	6.0356e-01	73.046	7.0527e-02	4.2784e-01
	90%.cl	±8.1e-03	±2.1e-03	±0.302	±4.3e-03	±1.4e-03
6	Ppgs	-1.1251e-02	1.8710e-01	-179.098	3.5694e-02	1.3238e-01
	90%.cl	±2.5e-03	±4.6e-04	±0.068	±2.8e-03	±3.4e-04
7	Pfdgs	-8.3819e-03	6.2676e-02	-99.091	5.1080e-02	4.4377e-02
	90%.cl	±5.1e-03	±5.9e-04	±0.695	±1.9e-03	±4.2e-04
8	Ialt	-3.9623e-02	2.7898e+01	87.928	5.1482e-02	1.9753e+01
	90%.cl	±7.2e-02	±4.5e-02	±0.307	±4.3e-03	±3.2e-02
9	Valt	3.5123e-02	1.7818e+02	59.074	4.6598e-02	1.2613e+02
	90%.cl	±6.6e-01	±4.3e-01	±0.190	±4.7e-03	±2.9e-01
10	Vacld	-2.5923e-01	1.5646e+02	89.724	4.9056e-02	1.1077e+02
	90%.cl	±4.2e-01	±4.1e-01	±0.278	±4.1e-03	±2.8e-01
11	Vcap	3.9731e-01	9.6776e+01	-2.629	3.7530e-02	6.8479e+01
	90%.cl	±3.2e-01	±3.6e-01	±0.054	±4.1e-03	±2.6e-01
12	Iaux	3.0398e-05	3.2348e+00	66.306	6.5844e-02	2.2923e+00
	90%.cl	±1.3e-02	±3.4e-02	±0.222	±4.3e-03	±2.4e-02

STEADY STATE DATA

Freque	Freq	Pmean	dPdbrg	dPpbrg	Perderr	Xpar	Xdar	Kwsmh
6.2190e+01	6.2207e+01	5.0329e+00	1.1696e+03	1.2052e+03	3.3671e-01	8.8681e-03	8.6653e-04	3.1875e+00
±1.8e-02	±3.4e-02	±8.0e-03	±1.2e+00	±1.7e+00	±1.9e-04	±1.1e-05	±2.4e-06	±2.9e-02
Kwssh	Kwalt	Kwltb	Kwlddc	Kwalts	Fleh	Flec	Flac	Flcwt
-1.0652e-02	2.2084e+00	2.1715e+00	2.1900e+00	3.1006e-04	1.1926e+00	1.2237e+00	5.8352e-02	1.2684e+00
±4.9e-03	±1.1e-03	±3.2e-02	±1.7e-03	±7.5e-03	±2.2e-03	±4.5e-03	±1.6e-04	±4.7e-03
Tzero	Toven2	Toven3	Toven4	Tehi	Tehid	dTeha	dTeh	Teho
0.0000e+00	6.6114e+01	6.5256e+01	6.4860e+01	3.1681e+02	3.1653e+02	-3.6569e+00	-3.2341e+00	3.1283e+00
±0.0e+00	±5.5e-02	±8.6e-02	±6.3e-02	±1.2e-01	±1.3e-01	±7.3e-02	±1.4e-01	±1.3e-01
Tehod	Teci	Tecid	dTeca	dTec	Teco	Tecod	Taci	dTac
3.1321e+02	1.7364e+01	1.6827e+01	2.1655e+00	2.0832e+00	2.0142e+01	1.8747e+01	1.8384e+01	1.2185e+00
±1.4e-01	±9.4e-02	±1.1e-01	±3.4e-02	±3.4e-02	±9.7e-02	±4.4e-02	±1.4e-01	±2.4e-02
Taco	Tcwl	dTcwl	dTcwl	dTectp	dPdbf	dPpbf	Peci	Peco
1.9394e+01	1.9077e+01	5.3067e-01	0.0000e+00	1.9234e-03	1.2479e+03	1.7985e+03	2.6754e+02	1.5074e+02
±5.5e-02	±8.7e-02	±8.9e-02	±0.0e+00	±5.9e-06	±3.7e+00	±1.2e+01	±2.0e+00	±9.3e-01
Paci	Paco	Pcwp	Pspair	Pdbrgs	Ppbrgs	Pbrgri	Pstreg	dPcwp
0.0000e+00	1.2206e+02	-2.8233e+01	2.4173e+01	6.0294e+00	6.0729e+00	4.8930e+00	1.6065e+01	5.7349e+05
±0.0e+00	±5.5e-01	±2.5e-01	±2.5e-02	±7.4e-03	±1.1e-02	±7.9e-03	±7.4e-03	±2.5e+03
Vdc	Idc	Tcs1	Tcs2	Tfdgs	Tadgs	Tpgs1	Tpgs2	Tes1
1.1023e-01	0.0000e+00	0.0000e+00	1.7595e+01	0.0000e+00	0.0000e+00	2.5607e+01	0.0000e+00	3.0103e+02
±1.4e-04	±0.0e+00	±0.0e+00	±5.2e-02	±0.0e+00	±0.0e+00	±1.7e-01	±0.0e+00	±9.6e-02
Tes2	Tes3	Tes4	Thuld1	Thuld2	Tcyl	Talt	Tgcr1	Tgcr2
3.0401e+02	0.0000e+00	0.0000e+00	1.0124e+02	7.7345e+01	2.3961e+01	2.2847e+01	1.6721e+01	2.0912e+01
±1.3e-01	±0.0e+00	±0.0e+00	±1.4e-01	±1.5e-01	±1.5e-01	±1.4e-01	±1.5e-01	±9.6e-02

SPRE PC/TDAS Build 13, Report Date: Thu Jul 21 11:01:21 1994
 DataFile: 121793.dta ChanFile: chspre05 DATE: 12-17-93 TIME: 10:07:27
 Avg of 5 RdgNs: 19.*

STEADY STATE DATA

Tjrsrf	Tsesrf	Tsbsrf	Tesrf1	Tesrf2	Tesrf3	Tghr1	Tghr2	Tghr3
2.1792e+01	2.3069e+02	4.4923e+01	2.8083e+02	2.5320e+02	2.5483e+02	0.0000e+00	0.0000e+00	0.0000e+00
±1.6e-01	±8.4e-02	±6.3e-02	±1.3e-01	±9.3e-02	±1.5e-01	±0.0e+00	±0.0e+00	±0.0e+00
Tghr4	Tascyl	Tkman1	Tkman2	Tkman3	Tctws	Tctwr	Tcwhei	Tcwheo
0.0000e+00	-6.9358e+01	1.9868e+01	2.7111e+01	2.1537e+01	1.0709e+01	9.6770e+00	5.4003e+01	1.3853e+01
±0.0e+00	±1.2e-01	±8.1e-02	±1.7e-01	±1.0e-01	±1.3e-01	±8.6e-02	±9.7e-02	±9.9e-02
Tcwc	Tbrgr	Tdbrgs	Tpbrgs	Tsresa	Tsresb	Disz	Velx	Vely
1.7476e+01	2.3157e+01	2.6649e+01	3.4571e+01	3.1707e+02	3.1658e+02	0.0000e+00	1.1601e-02	1.0279e-03
±1.6e-01	±1.3e-01	±1.2e-01	±1.4e-01	±2.5e-01	±1.2e-01	±0.0e+00	±4.8e-05	±3.2e-05
Velz	Accx	Accy	Accz	Vsp	Mtrspd	Patm		
0.0000e+00	1.9352e-03	1.6946e-03	6.1211e-02	1.0799e+02	-1.5625e-01	1.0000e+05		
±0.0e+00	±1.7e-05	±3.5e-05	±1.9e-04	±3.5e-02	±8.1e-01	±0.0e+00		

CALCULATIONS, rev: clnspre

tehw	tecw	trtow	tehf	tecf	tclna	trtof	trtec*	pvpst
3.1318e+02	1.9037e+01	2.0067e+00	3.1498e+02	1.8447e+01	1.8447e+01	2.0169e+00	0.0000e+00	2.6116e+00
±1.2e-01	±7.6e-02	±5.3e-04	±1.2e-01	±8.1e-02	±8.1e-02	±4.6e-04	±0.0e+00	±1.9e-02
pwalt	pwacld	palts	etcno	etaph	etapvc	etal	etsys	dsfrq
2.1769e+00	2.1813e+00	2.5118e+00	5.0167e-01	2.0245e-01	1.9035e-01	8.6668e-01	1.6874e-01	5.7925e+01
±1.1e-02	±8.9e-03	±1.9e-02	±1.3e-04	±4.8e-03	±2.9e-03	±9.5e-03	±3.6e-03	±4.6e-02
xdrp	xdspet	vpa	vda	xca	xcph	pwads	pnads	akads
9.9359e-01	4.1926e-03	3.4669e+00	3.4447e+00	4.0216e-02	-1.7125e+02	1.1161e-01	1.4361e-01	2.6391e+05
±3.0e-03	±7.7e-06	±8.3e-03	±8.8e-03	±1.1e-04	±3.2e-02	±5.0e-03	±5.9e-03	±6.5e+02
cads	phads	pwfds	pnfds	akfds	cfds	phfds	pvpns	pwaps
1.8811e+01	1.8160e+02	7.1835e-02	9.2447e-02	2.8400e+04	1.2109e+01	1.8946e+02	3.3177e+00	8.4045e-02
±7.6e-01	±6.6e-02	±3.7e-03	±5.1e-03	±2.9e+02	±6.7e-01	±4.9e-01	±2.1e-02	±6.2e-03
pnaps	akaps	caps	phaps	pci*	pcphi*	pea*	peph*	dpa*
1.0678e-01	3.4712e+05	1.3986e+01	1.8090e+02	1.6516e-01	-1.6553e+02	5.1253e-01	-1.3842e+01	3.2859e-02
±8.0e-03	±4.0e+02	±1.1e+00	±6.8e-02	±4.9e-04	±5.6e-02	±1.4e-03	±1.0e-01	±5.4e-04
dpph*	pcpm	pratio	dtslt*	qeh1	qec1	qac	dtffh	flehc
7.1187e+01	1.0261e-01	1.2287e+00	0.0000e+00	1.2903e+01	1.1109e+01	2.9808e-01	1.8040e+00	1.2056e+00
±2.4e-01	±3.5e-04	±8.6e-04	±0.0e+00	±2.7e-01	±1.6e-01	±5.6e-03	±3.6e-02	±2.2e-03
dpehm	pwrehm	dpecm	pwrecm	qbleng	qblalt	qblsys	dtffc	tqin*
1.1302e+02	1.3625e-01	5.9248e+01	7.2503e-02	1.0637e+00	9.4770e-01	1.0531e+00	5.9036e-01	9.0045e+00
±4.1e-01	±7.4e-04	±4.4e-01	±8.0e-04	±3.1e-02	±1.1e-02	±3.1e-02	±8.7e-03	±1.9e-02
tqrj*	pwrfcd	pwrfcp	pwdrd	pwtds	pwmp	falta	faltph	balte
6.2225e+00	-2.1757e+00	1.2070e+01	1.7033e-01	1.8345e-01	2.6608e-03	1.3138e+07	-6.9280e-04	4.5045e+01
±3.1e-02	±1.6e-02	±2.3e-02	±3.6e-04	±1.5e-03	±1.7e-03	±3.4e+04	±2.3e-06	±2.9e-01
paltls	cap	aind	baltm	pwdcas	pwmpn	prwprn	rhoslt	cpslt
3.3496e-01	7.3773e+02	8.4058e+00	4.7095e+05	1.5778e-02	3.4273e-03	1.1643e-02	1.8528e+00	1.5630e+00
±2.6e-02	±3.3e+00	±6.4e-02	±1.4e+03	±4.8e-05	±2.3e-03	±1.3e-05	±8.6e-05	±0.0e+00
muslt	rhocl	cpcl	mucl	prncl				
2.8905e+00	1.0003e+00	4.1913e+00	1.0766e+00	7.0925e+00				
±2.2e-03	±1.6e-05	±7.3e-05	±2.0e-03	±1.6e-02				

CONSTANTS

DROD	DFDS	DADS	DPIST	DDISP	MDISP	MPIST	MCASE	AKMAG
4.5720e-02	8.5126e-02	8.3666e-02	1.4478e-01	1.1414e-01	1.6789e+00	9.7420e+00	2.2930e+03	1.3290e-05
ehm	ecm	apist	aads	afds	arod			
2.2727e-02	2.2727e-02	1.6463e-02	3.8561e-03	4.0496e-03	1.9355e-04			

SPRE PC/TDAS Build 13, Report Date: Fri Jul 15 14:15:58 1994
 DataFile: 121793.dta ChanFile: chspre05 DATE: 12-17-93 TIME: 11:41:34
 Avg of 5 RdgNs: 56.*

DYNAMIC DATA, ncy: 4, nsam: 257

No.	Name	Mean	Amplitude	Phase	THD	RMS
1	Xp	-1.2926e+00	8.0228e+00	0.000	1.0056e-01	5.7016e+00
	90%.cl	±8.3e-02	±5.5e-02	±0.000	±3.4e-03	±4.0e-02
2	Xd	5.2367e-02	8.8805e+00	76.856	1.0129e-01	6.3116e+00
	90%.cl	±1.5e-01	±4.9e-02	±0.898	±4.2e-03	±3.3e-02
3	Pcs	1.5953e+00	1.2003e+00	-10.058	1.1175e-01	8.5401e-01
	90%.cl	±1.4e-02	±7.7e-03	±0.155	±5.1e-03	±5.3e-03
4	Pes	-1.1407e-02	1.2161e+00	-14.293	1.1386e-01	8.6547e-01
	90%.cl	±1.5e-02	±8.0e-03	±0.210	±5.5e-03	±5.4e-03
5	Padgs	-1.5114e-01	1.5321e+00	78.224	1.2062e-01	1.0912e+00
	90%.cl	±2.7e-02	±1.1e-02	±0.870	±8.6e-03	±7.4e-03
6	Ppgs	-4.6537e-02	4.3092e-01	178.155	9.9367e-02	3.0621e-01
	90%.cl	±7.4e-03	±2.7e-03	±0.109	±3.6e-03	±2.0e-03
7	Pfdgs	-6.6224e-02	1.6673e-01	-92.978	1.0382e-01	1.1853e-01
	90%.cl	±1.4e-02	±1.4e-03	±0.806	±3.9e-03	±9.5e-04
8	Ialt	-1.8080e-01	6.1407e+01	91.233	1.0074e-01	4.3641e+01
	90%.cl	±7.7e-01	±3.9e-01	±0.753	±3.9e-03	±2.6e-01
9	Valt	-3.0541e+00	3.7004e+02	35.045	1.0042e-01	2.6297e+02
	90%.cl	±2.3e+00	±3.0e+00	±0.542	±3.8e-03	±2.2e+00
10	Vacld	-9.4107e-01	2.0659e+02	90.902	1.0064e-01	1.4682e+02
	90%.cl	±2.7e+00	±1.6e+00	±0.762	±3.8e-03	±1.1e+00
11	Vcap	-2.0255e+00	3.0640e+02	0.947	9.9858e-02	2.1774e+02
	90%.cl	±2.6e+00	±2.8e+00	±0.045	±3.7e-03	±2.1e+00
12	Iaux	1.2540e-03	0.0000e+00	0.000	0.0000e+00	3.6867e-03
	90%.cl	±1.2e-04	±0.0e+00	±0.000	±0.0e+00	±2.9e-04

STEADY STATE DATA

Freque	Freq	Pmean	dPdbrg	dPpbrg	Perderr	Xpar	Xdar	Kwsnh
9.4744e+01	9.4758e+01	1.2507e+01	1.1615e+03	1.2034e+03	3.4257e-01	8.0477e-03	8.7837e-04	3.1921e+01
±5.2e-02	±5.9e-02	±6.6e-03	±2.0e+01	±1.5e+01	±3.6e-04	±8.9e-06	±2.4e-06	±4.2e-02
Kwssh	Kwalt	Kwaltr	Kwlddc	Kwalts	Fleh	Flec	Flac	Flcwt
-1.2428e-02	6.5597e+00	6.4169e+00	9.5222e+00	-4.3408e-03	1.1882e+00	1.2073e+00	5.8236e-02	1.2561e+00
±6.0e-03	±9.9e-03	±4.0e-02	±2.0e-02	±1.2e-02	±1.5e-03	±2.4e-02	±1.2e-03	±2.1e-02
Tzero	Toven2	Toven3	Toven4	Tehi	Tehid	dTeha	dTeh	Teho
0.0000e+00	6.6056e+01	6.5187e+01	6.4818e+01	3.4418e+02	3.4402e+02	-1.1096e+01	-1.0634e+01	3.3268e+02
±0.0e+00	±4.0e-02	±8.1e-02	±1.2e-01	±1.5e-01	±1.6e-01	±8.0e-02	±7.0e-02	±1.5e-01
Tehod	Teci	Tecid	dTeca	dTec	Teco	Tecod	Taci	dTac
3.3299e+02	2.4964e+01	2.4495e+01	6.0473e+00	6.0051e+00	3.1679e+01	3.0462e+01	2.6274e+01	4.4838e+00
±2.2e-01	±1.4e-01	±7.0e-02	±8.8e-02	±8.8e-02	±1.1e-01	±8.9e-02	±4.1e-01	±1.8e-01
Taco	Tcwl	dTcwl	dTcwl	dTectp	dPdbf	dPpbf	Peci	Peco
3.0519e+01	3.1871e+01	1.5445e+00	0.0000e+00	5.7606e-03	1.3254e+03	2.1898e+03	2.5588e+02	1.4370e+02
±2.6e-01	±1.7e-01	±9.2e-02	±0.0e+00	±1.8e-05	±5.9e+00	±2.7e+01	±9.6e+00	±5.7e+00
Paci	Paco	Pcpwi	Pspair	Pdbrgs	Ppbrgs	Pbrgri	Pstreg	dPcwp
0.0000e+00	1.1699e+02	-2.6755e+01	2.4481e+01	1.3505e+01	1.3559e+01	1.2334e+01	1.6107e+01	5.6194e+05
±0.0e+00	±4.6e+00	±1.2e+00	±2.5e-02	±2.2e-02	±2.4e-02	±1.5e-02	±7.4e-03	±1.8e+04
Vdc	Idc	Tcs1	Tcs2	Tfdgs	Tadgs	Tpgs1	Tpgs2	Tes1
1.4584e-01	0.0000e+00	0.0000e+00	3.1620e+01	0.0000e+00	0.0000e+00	3.8440e+01	0.0000e+00	3.2774e+02
±1.6e-04	±0.0e+00	±0.0e+00	±1.3e-01	±0.0e+00	±0.0e+00	±1.5e-01	±0.0e+00	±2.4e-01
Tes2	Tes3	Tes4	Thwld1	Thwld2	Tcyl	Talt	Tgr1	Tgr2
3.3795e+02	0.0000e+00	0.0000e+00	1.0098e+02	7.7350e+01	3.7716e+01	3.6568e+01	3.0840e+01	3.6011e+01
±3.1e-01	±0.0e+00	±0.0e+00	±2.0e-01	±1.0e-01	±8.4e-02	±9.6e-02	±1.8e-01	±2.1e-01

STEADY STATE DATA

Tjrsrf	Tsesrf	Tsbsrf	Tesrf1	Tesrf2	Tesrf3	Tghr1	Tghr2	Tghr3
3.2551e+01	2.6347e+02	5.0077e+01	3.1199e+02	2.8906e+02	2.9253e+02	0.0000e+00	0.0000e+00	0.0000e+00
±3.9e-01	±1.3e-01	±1.7e-01	±4.7e-01	±1.8e-01	±1.9e-01	±0.0e+00	±0.0e+00	±0.0e+00
Tghr4	Tascyl	Tkman1	Tkman2	Tkman3	Tctws	Tctwr	Tcwhei	Tcwheo
0.0000e+00	-6.9299e+01	2.0289e+01	2.6950e+01	2.1075e+01	1.2865e+01	9.6715e+00	5.2447e+01	1.8963e+01
±0.0e+00	±1.8e-01	±1.7e-01	±5.8e-02	±1.4e-01	±1.2e-01	±1.2e-01	±9.9e-02	±1.1e-01
Tcwc	Tbrgr	Tdbrgs	Tpbrgs	Tsresa	Tsresb	Disz	Velx	Vely
2.5180e+01	3.5832e+01	2.9871e+01	3.4592e+01	3.4346e+02	3.4318e+02	0.0000e+00	1.0116e-02	9.2472e-04
±1.1e-01	±1.6e-01	±2.1e-01	±1.6e-01	±1.9e-01	±1.1e-01	±0.0e+00	±2.1e-05	±1.3e-05
Velz	Accx	Accy	Accz	Vsp	Mtrspd	Patm		
2.2265e-03	9.7373e-03	7.0130e-03	-6.2737e-02	1.4294e+02	-3.1250e-01	1.0000e+05		
±2.1e-05	±1.0e-04	±1.3e-04	±0.0e+00	±5.5e-02	±5.3e-01	±0.0e+00		

CALCULATIONS, rev: clnspre

tehw	tecw	trtow	tehf	tecf	tcina	trtof	trtec*	pvpst
3.3326e+02	2.9608e+01	2.0029e+00	3.3863e+02	2.7987e+01	2.7987e+01	2.0316e+00	0.0000e+00	8.2406e+00
±2.0e-01	±1.3e-01	±8.0e-04	±1.7e-01	±1.3e-01	±1.3e-01	±6.3e-04	±0.0e+00	±2.7e-02
pwalt	pwacld	palts	etcrno	etapvh	etapvc	etalt	etsys	dsfrq
6.3223e+00	6.3429e+00	8.7340e+00	5.0074e-01	2.1466e-01	2.1283e-01	7.2386e-01	1.6469e-01	9.1312e+01
±1.4e-01	±8.6e-02	±4.8e-02	±2.0e-04	±1.6e-03	±4.8e-03	±1.5e-02	±4.2e-03	±2.4e-02
xdrp	xdspet	vpa	vda	xca	xcph	pwads	pnads	akads
1.1069e+00	4.3300e-03	4.7760e+00	5.2865e+00	3.6124e-02	-1.6990e+02	3.7280e-01	4.7283e-01	6.6507e+05
±1.3e-02	±2.5e-05	±3.4e-02	±3.0e-02	±2.9e-04	±1.4e-01	±1.9e-02	±2.8e-02	±1.8e+03
cads	phads	pwfds	pnfds	akfds	cfds	phfds	pvpns	pwaps
2.6685e+01	1.8137e+02	3.1497e-01	3.9941e-01	7.4837e+04	2.2541e+01	1.9017e+02	1.2804e+01	-5.4558e-01
±1.6e+00	±8.5e-02	±3.1e-03	±6.7e-03	±5.5e+02	±3.7e-01	±2.1e-01	±2.0e-01	±3.6e-02
pnaps	akaps	caps	phaps	pci*	pcphi*	pea*	peph*	dpa*
-8.4744e-01	8.8379e+05	-4.7825e+01	5.3815e+02	1.4830e-01	-1.6329e+02	1.2010e+00	-1.6163e+01	1.2785e-01
±5.0e-02	±6.6e+02	±2.8e+00	±1.1e-01	±1.3e-03	±2.4e-01	±7.7e-03	±3.0e-01	±2.4e-03
dpph*	pcpm	pratio	dtslt*	qeh1	qec1	qac	dtffh	flehc
7.7232e+01	9.5969e-02	1.2123e+00	0.0000e+00	3.8391e+01	3.0489e+01	1.0902e+00	5.3759e+00	1.2022e+00
±8.0e-01	±6.6e-04	±1.6e-03	±0.0e+00	±2.5e-01	±8.9e-01	±3.8e-02	±3.7e-02	±1.5e-03
dpehm	purehm	dpecm	pwrecm	qbleng	qblalt	qblsys	dtffc	tqin*
1.1029e+02	1.3259e-01	5.6896e+01	6.8716e-02	1.0088e+00	8.9947e-01	9.8728e-01	1.6202e+00	3.2413e+01
±2.8e-01	±5.0e-04	±2.2e+00	±4.0e-03	±2.3e-02	±1.8e-02	±2.4e-02	±4.7e-02	±1.0e-01
tqrj*	pwrfcd	pwrfcp	pwdrd	pwtds	pwmp	falta	faltph	balte
2.3559e+01	-1.9382e+00	1.2266e+01	6.1313e-01	6.8777e-01	-2.2448e-02	2.7575e+07	-7.9272e-04	4.3128e+01
±1.0e-01	±6.6e-03	±1.4e-02	±2.0e-03	±2.2e-02	±2.1e-02	±2.0e+05	±1.0e-05	±1.0e+00
paltls	cap	aind	balrm	pwdcas	pwmpn	prwprm	rhoslt	cpslt
2.4117e+00	3.3668e+02	8.2902e+00	4.4907e+05	5.2196e-02	-2.8563e-02	4.1163e-02	1.8350e+00	1.5630e+00
±1.2e-01	±5.1e+00	±1.5e-01	±5.9e+03	±1.8e-04	±2.7e-02	±7.9e-05	±1.3e-04	±0.0e+00
muslt	rhocl	cpcl	mucl	prncl				
2.4807e+00	9.9804e-01	4.1841e+00	8.8998e-01	5.6134e+00				
±2.7e-03	±3.3e-05	±7.7e-05	±1.8e-03	±1.5e-02				

CONSTANTS

DROD	DFDS	DADS	DPST	DDISP	MDISP	MPST	MCASE	AKMAG
4.5720e-02	8.5126e-02	8.3666e-02	1.4478e-01	1.1414e-01	1.6789e+00	9.7420e+00	2.2930e+03	1.3290e-05
ehm	ecm	apist	aads	afds	arod			
2.2727e-02	2.2727e-02	1.6463e-02	3.8561e-03	4.0496e-03	1.9355e-04			

SPRE PC/TDAS Build 13, Report Date: Wed Jul 20 08:52:22 1994
 DataFile: 121793.dta ChanFile: chspre05 DATE: 12-17-93 TIME: 11:43:50
 Avg of 5 RdgNs: 57.*

DYNAMIC DATA, ncy: 4, nsam: 257

No,	Name,	Mean,	Amplitude,	Phase,	THD,	RMS
1	Xp	-1.1477e+00	8.9795e+00	0.000	1.1245e-01	6.3896e+00
	90%.cl	±1.5e-01	±6.0e-02	±0.000	±7.5e-03	±4.4e-02
2	Xd	-2.0520e-01	9.7165e+00	75.314	1.1228e-01	6.9139e+00
	90%.cl	±7.7e-02	±1.0e-01	±0.917	±8.7e-03	±7.3e-02
3	Pcs	1.5513e+00	1.3350e+00	-9.457	1.2551e-01	9.5138e-01
	90%.cl	±1.3e-02	±1.0e-02	±0.188	±4.2e-03	±7.5e-03
4	Pes	-9.9295e-04	1.3487e+00	-13.645	1.2679e-01	9.6132e-01
	90%.cl	±1.6e-02	±1.1e-02	±0.262	±4.0e-03	±8.0e-03
5	Padgs	-1.1814e-01	1.6716e+00	76.639	1.3153e-01	1.1922e+00
	90%.cl	±3.9e-02	±1.9e-02	±0.972	±1.0e-02	±1.2e-02
6	Ppgs	-2.9417e-02	4.8282e-01	178.204	1.1107e-01	3.4351e-01
	90%.cl	±3.2e-02	±3.2e-03	±0.140	±9.1e-03	±2.2e-03
7	Pfdgs	-3.2024e-02	1.8145e-01	-94.577	1.1523e-01	1.2915e-01
	90%.cl	±2.9e-02	±1.5e-03	±1.068	±9.1e-03	±1.1e-03
8	Ialt	-3.2300e-03	6.4166e+01	91.573	1.1209e-01	4.5657e+01
	90%.cl	±6.7e-01	±4.6e-01	±0.899	±7.1e-03	±3.3e-01
9	Valt	-2.6358e+00	3.9326e+02	37.289	1.1176e-01	2.7981e+02
	90%.cl	±5.7e+00	±3.1e+00	±0.370	±7.8e-03	±2.3e+00
10	Vacld	-6.4107e-01	2.3091e+02	91.233	1.1195e-01	1.6430e+02
	90%.cl	±2.5e+00	±1.1e+00	±0.900	±7.2e-03	±8.0e-01
11	Vcap	-1.9132e+00	3.1809e+02	1.164	1.1155e-01	2.2633e+02
	90%.cl	±5.2e+00	±1.4e+00	±0.190	±8.3e-03	±1.0e+00
12	Iaux	1.1704e-03	0.0000e+00	0.000	0.0000e+00	3.4805e-03
	90%.cl	±3.2e-04	±0.0e+00	±0.000	±0.0e+00	±4.8e-04

STEADY STATE DATA

Freque	Freq	Pmean	dPdbrg	dPpbrg	Perderr	Xpar	Xdar	Kwsmh
9.4573e+01	9.4617e+01	1.2505e+01	1.1378e+03	1.2014e+03	3.4375e-01	9.0573e-03	9.5983e-04	3.1921e+0
±1.0e-01	±1.2e-01	±2.5e-02	±1.7e+01	±1.9e+01	±6.9e-04	±1.6e-05	±2.5e-06	±1.8e-02
Kwssh	Kwalt	Kwaltb	Kwlddc	Kwalts	Fleh	Flec	Flac	Flcwt
-1.4203e-02	7.6347e+00	7.4607e+00	1.0636e+01	-6.2012e-04	1.1875e+00	1.2117e+00	5.7739e-02	1.2542e+0
±6.0e-03	±1.3e-02	±7.3e-02	±1.9e-02	±2.9e-03	±1.4e-03	±9.5e-03	±3.0e-04	±2.1e-03
Tzero	Toven2	Toven3	Toven4	Tehi	Tehid	dTeha	dTeh	Teho
0.0000e+00	6.6114e+01	6.5214e+01	6.4935e+01	3.4409e+02	3.4384e+02	-1.3122e+01	-1.2631e+01	3.3044e+0
±0.0e+00	±5.2e-02	±9.2e-02	±3.1e-02	±2.0e-01	±2.4e-01	±1.0e-01	±1.0e-01	±1.8e-01
Tehod	Teci	Tecid	dTeca	dTec	Teco	Tecod	Taci	dTac
3.3086e+02	2.3072e+01	2.2553e+01	7.1408e+00	7.1699e+00	3.0989e+01	2.9611e+01	2.4186e+01	5.0078e+0
±1.2e-01	±2.4e-01	±8.9e-02	±9.7e-02	±7.1e-02	±6.7e-02	±7.2e-02	±7.2e-02	±9.9e-02
Taco	Tcwl	dTcwl	dTcwl	dTectp	dPdbf	dPpbf	Peci	Peco
2.8906e+01	3.0864e+01	1.7055e+00	0.0000e+00	6.8238e-03	1.3195e+03	2.1940e+03	2.5685e+02	1.4405e+0
±1.3e-01	±8.7e-02	±7.6e-02	±0.0e+00	±9.4e-06	±2.8e+00	±3.2e+01	±2.0e+00	±8.4e-01
Paci	Paco	Pcpwi	Pspair	Pdbrgs	Ppbrgs	Pbrgri	Pstreg	dPcpw
0.0000e+00	1.1764e+02	-2.6609e+01	2.4313e+01	1.3478e+01	1.3541e+01	1.2342e+01	1.5165e+01	5.7254e+0
±0.0e+00	±4.5e-01	±5.1e-01	±2.5e-02	±2.1e-02	±2.2e-02	±3.2e-02	±1.9e+00	±1.1e+03
Vdc	Idc	Tcs1	Tcs2	Tfdgs	Tadgs	Tpgs1	Tpgs2	Tes1
1.6267e-01	0.0000e+00	0.0000e+00	3.2857e+01	0.0000e+00	0.0000e+00	4.0279e+01	0.0000e+00	3.2154e+02
±1.1e-04	±0.0e+00	±0.0e+00	±1.2e-01	±0.0e+00	±0.0e+00	±2.1e-01	±0.0e+00	±1.3e-01
Tes2	Tes3	Tes4	Thwld1	Thwld2	Tcyl	Talt	Tgcr1	Tgcr2
3.3449e+02	0.0000e+00	0.0000e+00	1.0096e+02	7.7445e+01	3.9096e+01	3.9061e+01	3.0331e+01	3.5602e+01
±1.6e-01	±0.0e+00	±0.0e+00	±7.8e-02	±1.2e-01	±2.5e-01	±2.0e-01	±7.5e-02	±9.0e-02

STEADY STATE DATA

Tjrsrf	Tsesrf	Tsbsrf	Tesrf1	Tesrf2	Tesrf3	Tghr1	Tghr2	Tghr3
3.3774e+01	2.6428e+02	5.0336e+01	3.0751e+02	2.8857e+02	2.9353e+02	0.0000e+00	0.0000e+00	0.0000e+00
±3.7e-01	±1.3e-01	±8.1e-02	±2.5e-01	±1.1e-01	±8.1e-02	±0.0e+00	±0.0e+00	±0.0e+00
Tghr4	Tascyl	Tkman1	Tkman2	Tkman3	Tctws	Tctwr	Tcwhei	Tcwheo
0.0000e+00	-6.9003e+01	2.0428e+01	2.7162e+01	2.1598e+01	1.3395e+01	9.7254e+00	5.2325e+01	1.9813e+01
±0.0e+00	±1.1e-01	±7.9e-02	±9.7e-02	±9.2e-02	±1.0e-01	±1.1e-01	±1.4e-01	±1.2e-01
Tcwc	Tbrgr	Tdbrgs	Tpbrgs	Tsresa	Tsresb	Disz	Velx	Vely
2.3162e+01	3.7019e+01	2.9628e+01	3.4656e+01	3.4286e+02	3.4246e+02	0.0000e+00	1.1422e-02	1.1470e-03
±1.6e-01	±1.0e-01	±7.9e-02	±1.3e-01	±1.1e-01	±9.2e-02	±0.0e+00	±4.5e-05	±2.1e-05
Velz	Accx	Accy	Accz	Vsp	Mtrspd	Patm		
2.6948e-03	9.2194e-03	7.0482e-03	-6.2737e-02	1.5950e+02	1.5625e-01	1.0000e+05		
±2.1e-05	±1.2e-04	±3.2e-05	±0.0e+00	±0.0e+00	±4.3e-01	±0.0e+00		

CALCULATIONS, rev: clnspre

tehw	tecw	trtow	tehf	tecf	tclna	trtof	trtec*	pvpst
3.3118e+02	2.8563e+01	2.0030e+00	3.3753e+02	2.6642e+01	2.6642e+01	2.0370e+00	0.0000e+00	9.6334e+00
±2.7e-01	±2.7e-01	±1.7e-03	±2.3e-01	±2.5e-01	±2.5e-01	±1.7e-03	±0.0e+00	±7.3e-02
pwalt	pwacld	palts	etcno	etaph	etapvc	etalt	etsys	dsfrq
7.3660e+00	7.4082e+00	1.0235e+01	5.0074e-01	2.1236e-01	2.1042e-01	7.1963e-01	1.6238e-01	9.1306e+01
±2.3e-01	±8.8e-02	±8.0e-02	±4.1e-04	±2.6e-03	±2.3e-03	±1.7e-02	±5.2e-03	±9.0e-02
xdrp	xdspet	vpa	vda	xca	xcph	pwads	pnads	akads
1.0821e+00	4.7061e-03	5.3358e+00	5.7738e+00	4.0543e-02	-1.7023e+02	4.3007e-01	4.5569e-01	6.6321e+05
±1.8e-02	±3.4e-05	±3.3e-02	±6.5e-02	±2.2e-04	±1.2e-01	±3.6e-02	±4.1e-02	±2.1e+03
cads	phads	pwfds	pnfds	akfds	cfds	phfds	pvpns	pwaps
2.5813e+01	1.8133e+02	3.7226e-01	3.9437e-01	7.4449e+04	2.2338e+01	1.9011e+02	1.1949e+01	-6.6471e-01
±2.4e+00	±1.2e-01	±2.8e-03	±9.3e-03	±1.8e+02	±5.6e-01	±2.3e-01	±2.2e-01	±5.3e-02
pnaps	akaps	caps	phaps	pci*	pcphi*	pea*	peph*	dpa*
-8.2443e-01	8.8477e+05	-4.6694e+01	5.3820e+02	1.6655e-01	-1.6385e+02	1.3294e+00	-1.5511e+01	1.4081e-01
±6.6e-02	±2.2e+03	±3.7e+00	±1.4e-01	±9.0e-04	±1.8e-01	±1.2e-02	±2.9e-01	±1.7e-03
dpph*	pcpm	pratio	dtslt*	qeh1	qec1	qac	dtffh	flehc
7.5267e+01	1.0675e-01	1.2390e+00	0.0000e+00	4.5365e+01	3.6152e+01	1.2082e+00	6.3551e+00	1.2013e+00
±1.2e+00	±8.7e-04	±2.2e-03	±0.0e+00	±3.3e-01	±6.5e-01	±2.9e-02	±4.9e-02	±1.4e-03
dpehm	pwrehm	dpecm	pwrecm	qbleng	qblalt	qblsys	dtffc	tqin*
1.1023e+02	1.3243e-01	5.7399e+01	6.9554e-02	1.0093e+00	8.8999e-01	9.8599e-01	1.9212e+00	3.9266e+01
±2.5e-01	±4.5e-04	±9.0e-01	±1.6e-03	±2.2e-02	±1.7e-02	±2.2e-02	±3.5e-02	±1.3e-01
tqrj*	pwrfcd	pwrfcp	pwdrd	pwtds	pwmp	falta	faltph	balte
2.8890e+01	-1.8663e+00	1.2239e+01	7.4276e-01	8.0233e-01	3.5766e-03	3.0751e+07	-7.6979e-04	4.3047e+01
±5.6e-02	±1.0e-02	±1.7e-02	±2.4e-03	±3.7e-02	±3.9e-02	±1.8e+05	±1.1e-05	±1.2e+00
paltls	cap	aind	baltn	pwdcas	pwmpn	prwprn	rhoslt	cpslt
2.8690e+00	3.3948e+02	8.2093e+00	4.7926e+05	6.3151e-02	3.6796e-03	4.9976e-02	1.8359e+00	1.5630e+00
±1.6e-01	±3.5e+00	±9.1e-02	±6.1e+03	±2.8e-04	±4.0e-02	±1.2e-04	±1.8e-04	±0.0e+00
muslt	rhocl	cpcl	mucl	prncl				
2.4979e+00	9.9839e-01	4.1850e+00	9.0997e-01	5.7835e+00				
±3.7e-03	±6.5e-05	±1.7e-04	±4.0e-03	±3.3e-02				

CONSTANTS

DROD	DFDS	DADS	DPIST	DDISP	MDISP	MPIST	MCASE	AKMAG
4.5720e-02	8.5126e-02	8.3666e-02	1.4478e-01	1.1414e-01	1.6789e+00	9.7420e+00	2.2930e+03	1.3290e-05
ehm	ecm	apist	aads	afds	arod			
2.2727e-02	2.2727e-02	1.6463e-02	3.8561e-03	4.0496e-03	1.9355e-04			

```

/* -----
* Function(s):  calcs()
*
* Purpose:
*   This routine calculates results based on measured parameters
*   for the TDAS post processing programs.
*
* System(s):
*   UNIX ver Vr4 (ESIX)
*   MSDOS ver 5, Microsoft C v5.1
*
* Revision History:
*   DATE <current file name> Revision
*   1/19/89 Calculations compatible with HP1000 DAS.
*   FORTRAN Converted to QuickBasic 4.0 & 4.5.
*   4/27/89 Added PWRPRM calculation.
*   4/28/89 <calcv1> Issued.
*   3/18/91 <calcx0> Converted to MicroSoft "C v5.1"
*   3/19/91 <clnspre3> Original MTI SPRE calculations converted to MS "C"
*   1/12/93 <clnspre> NASA SPRE calculations for PC/AT trans DAS
*   2/16/93 <clnspre> Consistent between UNIX & MSDOS checked, no changes
*/
#include <string.h>
#include <math.h>
#define SQ(x) ((x)*(x))
#define FLT (float)
#define DBL (double)
void vadd(float *vs, float *vp, float v1, float p1, float v2, float p2);

const float pi= FLT 3.14159265;
const float rad= FLT 0.017453293;
const float deg= FLT 57.2957795;
const float sqr2= FLT 1.41421356;

const char revstr[] = "clnspre";

struct dynarr {
    float m, d, r, a, p;
};
struct dyn {
    struct dynarr
    xp, xd, pcs, pes, padgs,    ppgs, pfdgs, ialt, valt, vacld,
    vcap, accx;
};
struct ss {
    float
    freque, freq,    pmean, dpdbrg, dppbrg,
    perderr, xpar,    xdar,    kwsmh, kwssh,
    kwalt, kwaltb, kwlddc, kwalts, fleh,    flec,    flac,
    flcwt, opn19, opn20,    tzero, toven2, toven3, toven4,
    opn25, opn26, opn27, opn28, opn29,
    tehi, tehid, dteha, dteh,    teho,
    tehod, opn36, opn37, opn38, opn39,
    teci, tecid, dteca, dtec,    tecod,
    opn46, opn47, opn48, opn49, taci, dtac,    taco;
};
struct con {
    float
    drod, dfds, dads, dpist, ddisp,
    mdisp, mpist, mcase, akmag, ehm,    ecm,
    apist, aads, afds, arod;
};
struct calc {
    float
    teh, tecw, trtow, teh, tecf,    tclna, trtof, trtec,
    pvpst, pwalt, pwacld, palts,
    etcno, etapvh, etapvc, etalt,    etsys,

```

```

    dsfrq, xdrp, xdspet, vpa, vda, xca, xcph,
    pwads, pnads, akads, cads, phads,
    pwfds, pnfds, akfds, cfds, phfds, pvpsn,
    pwaps, pnaps, akaps, caps, phaps,
    pci, pcphi, pea, peph, dpa, dpph,
    pcpm, pratio, dtslt,
    qehl, qecl, qac, dtffh, flehc,
    dpehm, pwrehm, dpecm, pwrecm,
    qbleng, qblalt, qblsys, dtffc,
    tqin, tqrj, pwrfgd, pwrfgp,
    pwdrd, pwtids, pwpmp,
    falta, faltph, balte, paltls, cap, aind,
    baltm, pwdcas, pwpmpn, prwprm,
    rhoslt, cpslt, muslt, rhoel, cpcl, mucl, prncl,
    rload, phasld;
};
int calcsz( char *calcrv )
{
    /* Copy calculation revision string to main program */
    strcpy( calcrv, revstr );
    /* return no of calculated results */
    return( sizeof( struct calc )/sizeof(float) );
}
void calcs ( int *ncalc, struct dyn *d, struct ss *s, struct con *cn,
            struct calc *c)
{
    float afds; /* Fwd disp g.s. piston area, m^2 */
    float aads; /* Aft disp g.s. piston area, m^2 */
    float arod; /* Effective "disp rod" area, m^2 */
    float apist; /* Power piston area, m^2 */
    float ae; /* Projected exp space disp area, m^2 */
    float acd; /* Projected cmp space disp area, m^2 */
    float beta; /* Disp rod area ratio. */
    float omeg; /* OPERATING FREQUENCY, rad/sec */
    float xmpxp, xmdxd; /* Disp & Piston mass * amp products */
    float cpslt, rhoslt; /* Salt fluid properties */
    float muslt; /* salt viscosity */
    float rhoel; /* density of mixture, Kg/l */
    float cpcl; /* specific heat of mixture, w/s/(Kg/*C) */
    float akcl; /* thermal conductivity of mixture, w/(m/*C) */
    float mucl, prncl; /* Misc Clnt Params */
    float dtffh; /* local heater parameter */
    float dtffc, rencl, nucl, hcl, rensqpr; /* Misc Clnt Params */
    float texpa, tchrl, tcrl, tcmp;
    float psi;
    float vcl, vcphl, etaexd, pci; /* Misc Schmidt cycle param */
    float perl, peim; /* real & imag components of pe */
    float pwpcas, faltrl, faltim;
    float xxx; /* Temporary float number */
    float xda;
    float xpa;
    float xca;
    float pcsa;
    float padgsa;
    float pfdgsa;

    /*
    *---ENGINE CALCULATIONS
    *
    * CONSTANTS:
    */
    afds = pi/FLT 4 * ((*cn).dfds*(*cn).dfds - (*cn).drod*(*cn).drod);
    aads = pi/FLT 4 * ((*cn).dads*(*cn).dads - (*cn).drod*(*cn).drod);
    arod = afds - aads;
    apist = pi/FLT 4*(*cn).dpist*(*cn).dpist;
    ae = pi/FLT 4 * (*cn).ddisp*(*cn).ddisp;
    acd = ae - arod;
    beta = arod/ae;

```

```

(*cn).afds= afds;
(*cn).aads= aads;
(*cn).arod= arod;
(*cn).apist= apist;

/* HEATER CALCULATIONS
*
* Bulk heater salt temperature, C */
(*c).tehf=(*s).tehi+(*s).dteha*FLT 0.5;
if ( (*c).tehf < FLT 1000. && (*c).tehf > FLT 0. )
{
/* Salt fluid properties are for pure un-diluted HITEC
* above 155 C (310F) */
/* Salt specific heat, kW-s/(Kg-C) */
cpslt= FLT 1.5630;
(*c).cpslt= cpslt;
/* Salt density, Kg/l */
if ( (*c).tehf > FLT 155.0 )
rhoslt= FLT 2.0889 - FLT 0.7497e-3*(*c).tehf;
else
rhoslt= FLT 1.9727;
(*c).rhoslt= rhoslt;
/* Salt abs viscosity, ?? */
(*c).tehf= ((*c).tehf < FLT 1e19)?(*c).tehf: FLT 1e19 ;
muslt= FLT 5.45387e5*pow(DBL (*c).tehf , -2.111737);
muslt= ( muslt< FLT 1e19)?muslt: FLT 1e19 );
(*c).muslt= muslt;
/* Flow meter area temp correction: */
if ((*s).flehc < FLT 0.002)
(*c).flehc = FLT 0.0;
else
(*c).flehc= (*s).flehc * SQ( FLT 1.0 + FLT 17.28e-6 * (*c).tehf );

/* Salt side ht exch pressure drop, kPa */
(*c).dpehm= FLT 1732.74*SQ((*c).flehc)*rhoslt*pow(DBL muslt, 0.06)*(*cn).ehm;

/* Salt side ht exch pressure drop, kPa */
(*c).pwrehm= (*c).dpehm*(*c).flehc*FLT 1.0e-3;

/* Heat in, kW */
(*c).qehl = -rhoslt*cpslt* (*c).flehc * (*s).dteha + (*c).pwrehm;

/* Heater wall film delta temperature */
(*c).flehc= ( ((*c).flehc< FLT 1e19)?(*c).flehc: FLT 1e19);
if ((*c).flehc > FLT 0. )
dtffh= FLT 0.1555*pow(DBL (*c).flehc,-0.569) * (*c).qehl;
else
dtffh= FLT 0.;
(*c).dtffh= dtffh;
(*c).tehw= (*c).tehf- dtffh;
}

/*
*---COOLER CALCULATIONS
*/
/* Bulk coolant temperature, C */
(*c).tecf= (*s).teci + FLT 0.5*(*s).dteca;
if ( (*c).tecf < FLT 1000. && (*c).tecf > FLT 0. )
{
/*
* Check inlet temp. in normal range -20 to 100 C if not
* assume measurement error an use 25 C for properties.
*/
if ((*c).tecf > FLT -20.0 && (*c).tecf < FLT 100.0 )
(*c).tc1na = (*c).tecf;

```

```

else
    (*c).tclna= FLT 25.;
/* Coolant is assumed to be pure water.
   * Properties obtained from curve fit of data in
   * "Analysis of Heat and Mass Transfer", by Eckert & Drake
   */
/* Density kg/l */
rhocl= FLT 1.00268 - ( FLT 0.065523e-3 + FLT 3.58296e-6*(*)tclna )*(*)tclna;
    (*c).rhocl= rhocl;
/* Specific heat kJ/(kg-c) */
cpcl = FLT 4.21313 + ( FLT 1.52009e-5*(*)tclna - FLT 1.46123e-3 )*(*)tclna;
    (*c).cpcl = cpcl;
/* akcl = FLT 0.552 + FLT 0.00128*(*)tclna; */
mucl= FLT 1.734351+( FLT 5.750516e-4*(*)tclna - FLT 0.046264 )*(*)tclna;
    (*c).mucl= mucl;
/* prncl= mucl*cpcl/akcl; */
prncl= FLT 1.0/( FLT 0.069153 + FLT 0.0038944*(*)tclna );
    (*c).prncl= prncl;
/* Check for near zero coolant flow */
if ( (*s).flec < FLT 0.002 )
    (*s).flec =FLT 0.0;
/* Coolant side ht exch pressure drop, kPa */
mucl = ( (mucl< FLT 1e19)?mucl: FLT 1e19 );
/* Coolant side ht exch pressure drop, kPa */
(*c).pwrecm= (*c).dpecm*(*)s).flec*(float)1.0e-3;
/* Engine cooler heat reject */
(*c).qec1= rhocl * cpcl * (*s).dteca * (*s).flec;
/* Engine cooler wall temperature */
dtffc= FLT 0.0;
if ( (*s).flec > FLT 0.0 )
{
    /* Calculation from ESCORT */
    /* Coolant Reynolds No. */
rencl= FLT 1.6393*rhocl*(*)s).flec*( FLT 529.5 + FLT 24.353*(*)tecf );
    rensqpr = SQ(rencl)*prncl;
    rensqpr = (rensqpr < FLT 1e19) ? rensqpr : FLT 1e19;
    /* Nuselt No */
nucl= FLT 0.5*SQ(rencl)*pow( DBL rensqpr, 0.3333333 );
    /* (Af= 28.097e-4)/(As= 1.0755)= 26.1246e-4 */
hcl= FLT 162.37*nucl*(*)tecf/( FLT 1.2469 + FLT 1.5684*(*)tecf );
    if ( hcl > FLT 0 )
        dtffc= (*c).qec1*( FLT 958.4/hcl + FLT 0.053141 );
    else
        dtffc= FLT 0;
}
(*c).dtffc= dtffc;
(*c).tecw= (*c).tecf + dtffc;
}
/*
   * ENGINE TEMP RATIOS
   */
(*c).trtow= ((*c).tehw+FLT 273.15)/((*c).tecw+FLT 273.15);
(*c).trtof= ((*c).tehf+FLT 273.15)/((*c).tecf+FLT 273.15);

```

```

/*      (*c).texpa=(*s).tcexp1;
        (*c).tcompa=(*s).tcsl1;
        (*c).trtec=(texpa+FLT 273.15)/(tcomp+FLT 273.15);
    */

if ( (*s).freque == FLT 0. ) return;
/*
    *----- ENGINE DYNAMIC CALCULATIONS
    */
omg=FLT 2.0*pi*(*s).freque;
/* Design frequency at operating pressure, Hz
   ( Assumes design of 100 Hz at 150 Bar. ) */
(*c).dsfrq = FLT 100.*sqrt((double)(*s).pmean/FLT 15.0);

/*      Piston velocity amp, m/s */
(*c).vpa=(*d).xp.a*omg*FLT 0.001;

/*      Disp velocity amp, m/s */
(*c).vda=(*d).xd.a*omg*FLT 0.001;

/*      Disp / Piston amp ratio */
if ( (*d).xp.a != FLT 0. )
    (*c).xdrp=(*d).xd.a/(*d).xp.a;

/*      Calculated casing motion, amp units as Xp & Xd, phase deg */
(*c).xca = (*c).xcph = FLT 0.;
if ( (*cn).mcase != FLT 0. )
{
    xmpxp = (*cn).mpist*(*d).xp.a;
    xmdxd = (*cn).mdisp*(*d).xd.a;
    vadd(&((*c).xca), &((*c).xcph), xmpxp, (*d).xp.p, xmdxd, (*d).xd.p);
    (*c).xca = (*c).xca/(*cn).mcase;
    (*c).xcph = (*c).xcph-FLT 180.;
}

/*      Gas spring presure phase angles */
(*c).phads=(*d).padgs.p - (*d).xd.p + FLT 180.;
(*c).phaps=(*d).ppgs.p - (*d).xp.p + FLT 360.;
(*c).phfds=(*d).pfdgs.p - (*d).xd.p + FLT 360.;
if ( (*d).xd.a != FLT 0 && (*d).xp.a != FLT 0 )
{
    /*      Gas spring stiffness */
    (*c).akads=-aads*(*d).padgs.a/(*d).xd.a*cos(rad*(*c).phads)*FLT 1e9;
    (*c).akfds=-afds*(*d).pfdgs.a/(*d).xd.a*cos(rad*(*c).phfds)*FLT 1e9;
    (*c).akaps=-apist*(*d).ppgs.a/(*d).xp.a*cos(rad*(*c).phaps)*FLT 1e9;

    /*      Gas spring damping */
    (*c).cads=-aads*(*d).padgs.a/(*c).vda*sin(rad*(*c).phads)*FLT 1e6;
    (*c).cfds=-afds*(*d).pfdgs.a/(*c).vda*sin(rad*(*c).phfds)*FLT 1e6;
    (*c).caps=-apist*(*d).ppgs.a/(*c).vpa*sin(rad*(*c).phaps)*FLT 1e6;
}

/*      Gas spring power losses */
(*c).pwads=FLT 0.5e-3*(*c).cads*SQ((*c).vda);
(*c).pwaps=FLT 0.5e-3*(*c).caps*SQ((*c).vpa);
(*c).pwfds=FLT 0.5e-3*(*c).cfds*SQ((*c).vda);
/*      Total displacer gas spring power */
(*c).pwtlds=(*c).pwads+(*c).pwfds;

/*      Gas spring power normalized to 10mm amplitude at operating freq, w
    *      xxx - Local constant, (m/s)^2 */
xxx = FLT 0.5e-7*SQ(omg);
(*c).pnads=(*c).cads*xxx;
(*c).pnaps=(*c).caps*xxx;
(*c).pnfds=(*c).cfds*xxx;

/*
    *----- ENGINE THERMODYNAMIC CALCULATIONS
    */

```

```

/* Efficiency calculations */
334

if ( (*c).trtow != FLT 0. )
    (*c).etcno = FLT 1.0 - FLT 1.0 / (*c).trtow;
    (*c).xdspet = FLT 1.e-3 * (*c).etcno * (*d).xd.a * sin(rad* (*d).xd.p);
    ...
(*c).prwprm = FLT 1.e-3 * (*c).xdspet * (*s).pmean * (*s).freque * (*d).xp.a;

/* Pressure amplitude ratio, Pc/Pm: */
if ( (*s).pmean != FLT 0 )
    (*c).pcpm = (*d).pcs.a / (*s).pmean;

/* Pressure ratio (pca+pmean)/(pmean-pca) */
if ( (*s).pmean != (*d).pcs.a )
    (*c).pratio = ((*s).pmean + (*d).pcs.a) / ((*s).pmean - (*d).pcs.a);

/* Piston P-V power= (Pi*Ap*Xp*Pc*SinTHETA), kW */
(*c).pvpst = -pi * (*s).freque * apist * (*d).xp.a * (*d).pcs.a * sin(rad* (*d).pcs.p); 350

/* Power normalized to 10mm amplitude */
if ( (*d).xp.a != FLT 0 )
    (*c).pvpsn = (*c).pvpst * FLT 100. / (SQ((*d).xp.a));

/* Thermodynamic pist PV efficiency */
if ( (*c).qehl != FLT 0. )
    (*c).etapvh = (*c).pvpst / (*c).qehl;

if ( (*c).qehl != -(*c).pvpst )
    (*c).etapvc = (*c).pvpst / ((*c).qehl + (*c).pvpst);
360

/* Estimated exp heat in & comp heat rej */

(*c).tqin = -pi * (*s).freque * (*d).pcs.a * ae * (*d).xd.a * sin( rad* ((*d).pcs.p - (*d).xd.p) )
vadd(&vcl, &vcphl, acd* (*d).xd.a, (*d).xd.p, -apist* (*d).xp.a, (*d).xp.p);
(*c).tqrj = -pi * (*s).freque * (*d).pcs.a * vcl * sin( rad* ((*d).pcs.p - vcphl) );

/* Schmidt cycle pressure phase */
etaexd = (FLT 1. / (*c).trtow - FLT 1.0 + beta) * ae * (*d).xd.a;
370

/* Pressure factor calculation */
if ( (*d).xd.a < FLT 1. )
{
    if ( (*d).xp.a != FLT 0 )
        (*c).pwrfc = FLT 1e3 * (*c).pcpm / (*d).xp.a;
    else
        (*c).pwrfc = FLT 0.0;
    (*c).pwrfd = FLT 0.0;
}
else
{
    if ( (*d).pcs.p >= FLT 0.0 )
        psi = (*d).xd.p - (*d).pcs.p;
    else
        psi = FLT 180.0 - (*d).xd.p + (*d).pcs.p;

    (*c).pwrfd = FLT 1e3 * (*c).pcpm / sin(rad* (*d).xd.p) * sin(rad* (*d).pcs.p) / (*d).xd.a;
    (*c).pwrfc = FLT 1e3 * (*c).pcpm / sin(rad* (*d).xd.p) * sin(rad* psi
    ...
) / (*d).xp.a;
}
/*
*
* ---DISPLACER FORCE BALANCE
*
* The displacer force balance assumes the expansion space pressure
* is the only unknown pressure force.
390

```

```

* Finally the influence of casing amplitude is calculated on
* the basis of the system momentum balance (XCA & XCPH). The real
* (PERL) and imaginary (PEIM) exp pressures are first calculated
* { the amplitude (PEA) and phase (PEPH) w.r.t. the piston (XP.p)
* is calculated for output.
*-----
*/
xda= (*d).xd.a * FLT 0.001;
xpa= (*d).xp.a * FLT 0.001;
xca= (*c).xca * FLT 0.001;
pcsa= (*d).pcs.a * FLT 1.e6;
padgsa= (*d).padgs.a * FLT 1.e6;
pfdgsa= (*d).pfdgs.a * FLT 1.e6;
perl= SQ(omeg) * (*cn).mdisp * xda / ae
      + pcsa*(1.-beta)*cos(((d).pcs.p-(d).xd.p)*rad)
      + padgsa*aads/ae*cos((c).phads*rad)
      + pfdgsa*afds/ae*cos((c).phfds*rad)
      + xca * (*cn).mdisp * SQ(omeg) * cos(((c).xcph-(d).xd.p)*rad)/ae;
peim= pcsa*(1.-beta) * sin(((d).pcs.p - (d).xd.p) * rad)
      + padgsa*aads/ae*sin((c).phads*rad)
      + pfdgsa*afds/ae*sin((c).phfds*rad)
      + xca * (*cn).mdisp * SQ(omeg) * sin(((c).xcph-(d).xd.p)*rad)/ae;
(*c).pea= sqrt((double)perl*perl+peim*peim) / FLT 1.e6;
(*c).peph= atan2(peim,perl)*deg + (d).xd.p;
vadd(&((c).dpa), &((c).dpph), -(c).pea, (c).peph, (d).pcs.a, (d).pcs.p);

/* Displacer rod power */
(*c).pwwrd= -FLT 1e-3 * pi*(s).freque*pcsa*arod*xda*
            sin(rad*((d).pcs.p-(d).xd.p));

/* Displacer to case power transfer */
(*c).pwwcas= FLT 0.5e-3 * (*cn).mdisp*omeg*SQ(omeg)*xca*xda*
            sin(((c).xcph-(d).xd.p)*rad);
/* Case to piston power transfer
* Note : Since the power out of the piston thru the case is equal
* to the case power to the displacer then: */
pwwcas= -(c).pwwcas;

/* Net displacer pumping power */
(*c).pwwmp= (c).pwwrd-(c).pwwtds+(c).pwwcas;

/* Disp pumping power normalized to 10mm amp.*/
if ( (d).xd.a != FLT 0. )
    (*c).pwwmpn= (c).pwwmp* FLT 100. / SQ((d).xd.a);

/*
* ---ALTERNATOR CALCULATIONS
*/

/* Alternator & load power */
(*c).pwalt= FLT 0.5e-3*(d).valt.a*(d).ialt.a*cos( rad*( (d).valt.p-(d).ialt.p ))
(*c).pwacld = FLT 0.5e-3*(d).vacld.a*(d).ialt.a*cos( rad*( (d).vacld.p-(d).ialt.p ))
/* Net shaft power to alternator */
(*c).palts = (c).pvpst - (c).pwaps + pwwcas;

/* Total alternator losses */
(*c).paltls = (c).palts - (c).pwalt;

/* Alternator efficiency */
if ( (c).palts != FLT 0. )
    (*c).etalt = (c).pwalt/(c).palts;

/* System efficiency */
if ( (c).qehl != FLT 0. )
    (*c).etsys = (c).pwalt/(c).qehl;

```

463

```

/*
 * Alt force balance betam and betae calc,
 * The alternator force balance assumes the electrical force on
 * the plunger is the only unknown. Also, the bearing friction
 * is assumed to be negligible, ie. equal to zero.
 * Finally the influence of casing amplitude is calculated on
 * the basis of the system momentum balance (XCA & XCPH).
 * The real (FALTRL) and imaginary (FALTIM) forces are first
 * computed then the amplitude (FALTA) and phase (FALTPH) w.r.t.
 * the piston is calculated for output. */
faltrl= (*cn).mpist*SQ(omeg)*(*d).xp.a - (*cn).akmag*(*d).xp.a
- (*d).pcs.a*apist*cos((*d).pcs.p*rad)
+ (*d).ppgs.a*apist*cos((*d).ppgs.p*rad)
+ (*c).xca*(*cn).mpist*SQ(omeg)*cos((*c).xcph-(*d).xp.p)*rad);
faltim= - (*d).pcs.a*apist*sin((*d).pcs.p*rad)
+ (*d).ppgs.a*apist*sin((*d).ppgs.p*rad)
+ (*c).xca*(*cn).mpist*SQ(omeg)*sin((*c).xcph-(*d).xp.p)*rad);
(*c).falta= FLT sqrt ( (double)faltrl*faltrl + faltim*faltim );
(*c).faltph= FLT atan2( DBL faltim, DBL faltrl);

/* BALTM = Vgen/(d(Xp)/dt) = Felec/xialt, n/Amp (= V-s/m ) */
if ( (*d).ialt.a != FLT 0 )
    (*c).baltm= (*c).falta/(*d).ialt.a;

/* Measured tuning capacitance, uf */
if ( omeg * (*d).vcap.a != FLT 0. )
    (*c).cap = FLT 1e6 * (*d).ialt.a / (omeg * (*d).vcap.a);

/* Measured Load Resistance, ohms */
if ( (*d).ialt.a != FLT 0. )
    (*c).rload = (*d).vacld.a / (*d).ialt.a;

/* Measured Load Phase, deg */
(*c).phasld= (*d).vacld.p - (*d).ialt.p;

/* Effective alternator inductance, mH */
if ( ( xxx= omeg*(*d).ialt.a*sin((*d).ialt.p*rad) ) != FLT 0. )
    (*c).aind = FLT 1e3 * (*d).valt.a*sin((90.-(*d).valt.p)*rad) / xxx;

/* Effective Balte = Vgen/VPA, V*sec/m */
if ( ( xxx= (*c).vpa * sin((*d).ialt.p*rad) ) != FLT 0. )
    (*c).balte = (*d).valt.a*sin((90.-(*d).ialt.p+(*d).valt.p)*rad)/xxx;

/* Alt heat rejected */
(*c).qac = rhocl*cpcl * (*s).dtac * (*s).flac;

/*
 * -- ENERGY BALANCE CALCULATIONS
 */
if ( (*c).qehl != FLT 0. )
{
    /* Engine */
    (*c).qbleng = ((*c).qec1 + (*c).pvpst)/(*c).qehl;

    /* System: engine & alternator */
    (*c).qblsys = ((*c).pwalt + (*c).qec1 + (*c).qac)/(*c).qehl;
}

/* Alternator */
if ( (*c).pvpst != FLT 0. )
    (*c).qblalt = ((*c).pwalt + (*c).qac)/(*c).pvpst;

return;
}

```

470

480

500

510

REPORT DOCUMENTATION PAGEForm Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE January 1995	3. REPORT TYPE AND DATES COVERED Technical Memorandum	
4. TITLE AND SUBTITLE Transient and Steady-State Tests of the Space Power Research Engine With Resistive and Motor Loads			5. FUNDING NUMBERS WU-583-02-21	
6. AUTHOR(S) Jeffrey S. Rauch and M. David Kankam				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) National Aeronautics and Space Administration Lewis Research Center Cleveland, Ohio 44135-3191			8. PERFORMING ORGANIZATION REPORT NUMBER E-9391	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) National Aeronautics and Space Administration Washington, D.C. 20546-0001			10. SPONSORING/MONITORING AGENCY REPORT NUMBER NASA TM-106832	
11. SUPPLEMENTARY NOTES Jeffrey S. Rauch, NYMA, Inc., Engineering Services Division, 2001 Aerospace Parkway, Brook Park, Ohio 44142 (work funded by NASA Contract NAS3-27186), and M. David Kankam, NASA Lewis Research Center. Responsible person, M. David Kankam, organization code 5430, (216) 433-6143.				
12a. DISTRIBUTION/AVAILABILITY STATEMENT Unclassified - Unlimited Subject Categories 37 and 33 This publication is available from the NASA Center for Aerospace Information, (301) 621-0390.			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) The NASA Lewis Research Center (LeRC) has been testing free-piston Stirling engine/linear alternators (FPSE/LA) to develop advanced power convertors for space-based electrical power generation. Tests reported herein were performed to evaluate the interaction and transient behavior of FPSE/LA-based power systems with typical user loads. Both resistive and small induction motor loads were tested with the Space Power Research Engine (SPRE) power system. Tests showed that the control system could maintain constant long term voltage and stable periodic operation over a large range of engine operating parameters and loads. Modest resistive load changes were shown to cause relatively large voltage and, therefore, piston and displacer amplitude excursions. Starting a typical small induction motor was shown to cause large and, in some cases, deleterious voltage transients. The tests identified the need for more effective controls, if FPSE/LAs are to be used for stand-alone power systems. The tests also generated a large body of transient dynamic data useful for analysis code validation.				
14. SUBJECT TERMS Space power system; Free-piston Stirling engine; Linear alternator; Static and dynamic loads; Testing; Interactions; Stability; Control			15. NUMBER OF PAGES 147	
			16. PRICE CODE A07	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT	